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Christmas Electrical Trade.

WE wish to lay early stress upon the importance of the Christmas and New Year trade in electrical gifts, ranging from the small boy's toy pocket lamp to the most impressively finished electrical refrigerator calculated to bring joy to the heart of "the head of the household."

No doubt many of our contractor and retailer readers have already ordered large supplies of such products from the manufacturers and the wholesalers, though the public may not do much actual store and over-the-counter buying of a Christmas character until the month of December is reached with its National Electric Week. They will be wiser still if they also have their advertisement schemes, shop-window arrangements, and local circularisation plans prepared without further delay. Last-moment ordering is apt to bring disappointment and inadequate stocks of suitable lines, and traders who suffer the irritation that these things occasion in their businesses, may know for certain that if that state of things obtains they will not be giving the maximum of service, range of purchase, and pleasure to the public. Everybody who is making an appeal to the local or store purchaser will do the cause of electricity first-rate service by resolving that this time he will make a bigger effort than at any previous Christmas season. To that end he will avoid leaving his arrangements to the last moment. He will remember not only the great variety of illumination devices which are on the market for decorative and beautifying effects in the home, but also, and may we say, more particularly, apparatus and appliances for those "other uses" which can be so valuable an aid in raising the domestic load at these "other times" when the lights are switched off though the station plant is still running.

In our Special Domestic Electrification issue of October 21st we placed before the trade a host of appliances and articles of every description, from which, no

doubt, many contractors have already been making their lists of Christmas selling lines. It is also the custom of manufacturers and traders to advertise in the Electrical Review during the November and early December weeks the special gift lines for which they are in a position to give quick execution of orders. From that special issue, concerning which so many gratifying tributes have reached us, and from our advertising pages subsequently, the trade can soon make up its mind what it expects to be able to sell, and with efficiency in manufacturers' dispatch departments the goods may be in hand before railway congestion, fogs, or other handicaps hinder, and then hard selling for a period of two or three weeks may yield profitable turnover for the trader and plenty of "new points business" for the contractor.

Although the nation still carries a big burden of unemployment, there is justification for the belief in the mind of E.D.A. that there will be a large class of gift purchasers with "bulging pockets . . . at Christmas and the New Year"; for ourselves, we think that for a long period to come there will be an increase of electrical purchases as Christmas gifts every year. An electrical present is not like some other classes of gifts—pleasing for the moment or for the festive season and then cast aside with its novelty worn off; it is, if a wise choice be made, a gift that may bring continuous relief or attractiveness and enjoyment to the life of the domestic circle—whether it be an additional electric fire for comfort in the bedroom or boudoir; an electric kettle, a new iron, a toaster, a percolator, an art lighting standard or some choice fancy shading or glassware; a vacuum cleaner to lighten labour for a minimum current consumption; a water heater; a hair dryer for those who still require such; a refrigerator to add interest to the domains of the cook and the domestic; "something new in the wireless way" to take the place of, or supplement, apparatus which has already rendered full service; a medical apparatus to ease the pain of the sufferer from neuritis, or even that interesting range of children's electric trains, motors, and other professional lines which give paterfamilias so much enjoyment while the youngsters look on. All of these and many more that will occur to the reader's mind can be the means of strengthening the electrical habit and bringing into our common every-day life more and more of those "other uses" which are destined to profit the whole industry.

The Circle Campaign organised by E.D.A. includes a National Electric Week from December 3rd to 10th inclusive, but we have preferred not to wait until the actual event before emphasising the matter. We have published the details of this special Electric Week on another page of this issue, and here we would give forth an early watchword: "Be prepared!"

Wayleaves for Overhead Lines.

At the first regular meeting of the Overhead Lines Association, which took place on Wednesday last week and is reported in this issue, substantial progress was made towards defining its constitution and policy, and an interesting debate was held on the subject of "Wayleaves," giving proof of the determination of the members to get to work as soon as possible.

The most practical proposition that was put forward was that of Mr. W. Fennell, who apparently has only recently adopted it himself—namely, to "work the Act" instead of importuning owners and occupiers for permission to cross their land. That is to say, in accordance with Section 22 of the Electricity (Supply) Act, 1919, serve notices on the owner and occupier of intention to erect the line; if consent is not given on reasonable terms, apply to the Minister of Transport (in effect, the Electricity Commissioners) for consent, the Minister being empowered by the Section to give such consent if he thinks proper. In this way the onus is thrown upon the Department, the local staff is relieved of a most harassing and wearing task, and the right impression is created from the commencement; the landowner is not put into the position of granting favours, nor is he tempted to seize the fancied opportunity to squeeze the supply authority—on the contrary, it is for him to show cause why the line should not pass over his land, which is clearly the intention of the Section. Justice is served by the statutory proviso that the Minister, in making his decision, shall have regard to the effect of the proposed line on the amenities or value of the land—and if the case is properly stated it will in many cases be shown that the availability of a supply of electricity will actually *enhance* the value of the property. As Major T. Rich has explained, in France this consideration of increased value exercises a strong influence on the attitude of landowners and farmers towards the granting of wayleaves for overhead lines.

Low-pressure Overhead Lines.

Elsewhere in this issue Mr. W. T. Taylor, M.I.E.E., gives the relations existing between the present-day specified loadings for conductors and conductor-supports of this country, and the loadings which have just come into force in the United States. As a basis, he points out that we have a wider margin of safety for equivalent specified loadings due to the milder climatic conditions which obtain in this country, and it is shown that the most economical construction is that in which the allowable stresses vary with the location of a line and with the location of the support in a line, and where the overhead clearance of conductors to ground is a minimum—the existing minimum being too high. The latest American minimum height is, for the lower-voltage lines, 18 ft. across roads and 15-18 ft. along roads, the 15-ft. value referring to roads and hedges in rural districts.

The question of loadings on conductors has been somewhat in dispute since the change was made for 25 lb. horizontal wind without ice, and the graphical illustration showing the relations between the B.O.T. and the E.C. loadings for transverse and resultant values should help to clear the minds of those who are still in doubt as to the advantages of one over the other. In each case the factor of safety is not taken into account, because it varies from time to time, hence the graph is fundamental. The relative factors of safety are 5:2 for conductors, and 10:3.5 for wood poles. "Reasonable factor of safety" is not easy to define, but for rural lines in particular there should be no necessity to impose improbable loads which are considered to be possible, although probably not on record or only occurring so infrequently (and in a given locality, but not applicable to another) as to make their occurrence within any limited time very unlikely. Apart from knowledge of the amount and the effects of loads and resulting stresses, the right factor of safety depends on decay, corrosion, defects in materials, errors in designs, grade of workmanship, and so forth, and there is no reason to suppose that our materials, designs and workmanship are any worse and decay or corrosion greater than in the United States; therefore, we may hope that less onerous standards aiming at economy with safety, such as those suggested by Mr. Taylor, will be formulated as the result of the discussions which are now taking place, and will enable rural distribution lines to be erected at a greatly reduced outlay.

The Standardisation of Motor Frames.

The standardisation of certain important dimensions governing the interchangeability of electric motors of different makes has made a forward step, according to an announcement by the American Engineering Standards Committee, in respect of the recent acceptance by the American Society of Mechanical Engineers and the National Electrical Manufacturers' Association of joint leadership in the development of such standards.

Machinery everywhere is becoming more and more "motorised," being either driven by self-contained electric motors or adapted to the easy application of motor drive upon installation. This is particularly noteworthy in such fields as metal- and wood-working machinery of every description, household and commercial laundry machinery, refrigerating machines, foundry equipment, printing presses, steel mills, and so on. However, owing to the variation of sizes among different makes, specific and detailed information is often necessary with each new application, and in some cases significant changes in design have been required in order to accommodate some particular make of motor. Sometimes, as in the case of the breakdown of equipment in service, serious inconvenience has been caused, due to the impracticability of using a motor of any other make than the original one.

The National Machine Tool Builders' Association, which found the diversity in motor dimensions a problem of particular difficulty in its industry, made the original request to have the subject taken up by the American Engineering Standards Committee. A conference, to which all parties interested in this subject were invited, was called by the latter body, at which the following scope for the work was recommended:—

1. A series of standard dimensions for the distance from the base to centre of shaft (shaft height).
2. A series of standard distances between bolt holes, at right angles to the shaft.
3. A series of standard distances between bolt holes, parallel to shaft.
4. Certain definite combinations of a shaft height with any or both of the distances between bolt holes as mentioned under (2) and (3).
5. Maximum diameter and length of the motor.

Upon a recommendation by a special committee appointed by the conference, the National Electrical Manufacturers' Association and the American Society of Mechanical Engineers were appointed joint sponsors for the project. These bodies are now proceeding to the organisation of a sectional committee to take up the technical work.

We hardly need point out that standardisation on similar lines is of at least equal importance in this country; the annoyance and waste of time and money due to the lack of interchangeability of motors driving machines either directly or through gearing other than belts are painfully realised by those in charge of electrically-driven plant. It may be argued by Messrs. X that if their motor is the only one that will fit, Messrs. X's motor cannot be replaced by Messrs. Y's machine—but that argument cuts both ways, and, in the national interest, standardised dimensions would unquestionably be a boon to purchasers and a welcome relief to purchasers' engineers.

The question cannot have escaped the consideration of the British Engineering Standards Association, but so far as we are aware, no specification has yet been drafted. We trust that the Association will promptly take up the matter, which has become the more pressing since the American manufacturers have already "got busy" with it.

Electrical Showrooms.

ONE important indication of electrical "liveliness" is the number of showrooms which are being opened all over the country by the different branches of the industry. While it is not exactly a new departure, in the last year or so the rate of progress has been accelerated and the standard of the displays attains ever higher levels.

A most excellent example is described in this issue—"Electric House," recently opened by the Battersea Municipal Electricity Department. While this has been criticised as being unnecessarily lavish in design and arrangement, we consider that the Department has followed the right lines. It is said that an ordinary working-class *ménage* with the simplest fittings and appliances would serve the district in a better manner, but we do not agree. Such a display would not be attractive; the ordinary is never attractive. The West-End departmental store might be cited as an example of the success of the extraordinary. The windows of these concerns are often dressed with most expensive articles far beyond the reach of the majority who gaze upon them. Yet the business is tremendous and mainly consists of large sales of everyday requirements. Thus it is with electricity; the idea is to implant a desire for something better, and we believe that this is achieved by displays which are out of the ordinary.

Battersea is only one of the municipalities which have opened attractive showrooms and, moreover, the movement is not confined to municipal authorities. The supply companies are also doing good work in this direction, as witness the City of London Electric Lighting Co. and the Kensington and Knightsbridge Co., which have both opened well-arranged showrooms in their districts in recent times. The manufacturers, too, are alive to the importance of this method of electrical development. We described in our last issue the extension of the General Electric Co.'s premises in Kingsway; about a month ago we dealt with the new "Tricity" showrooms of the British Electric Transformer Co., Ltd.; and there are a number of other splendid examples in London and the provinces. Mention must also be made of the contractors' and wholesalers' part in these activities; several notable displays have come to our notice in recent months.

We have always maintained that showrooms are the most valuable form of publicity, and the results which are being reported confirm us in this opinion.

The "Grid" and Cheap Electricity.

MR. ARCHIBALD PAGE still continues the good work of dispelling the illusions built up by political exigency about the national electricity scheme—illusions and misstatements to which we repeatedly drew attention whilst the Bill was passing through Parliament. One of the worst of these was the promise of a "cheap supply" of electricity, coupled with references to prices in the neighbourhood of a penny per kWh, uttered sometimes by those who should have known better—for the general public makes no distinction between average price and individual prices, and does not realise that even an average of one penny does not mean that electricity can be supplied to houses, shops, and similar premises at much below 4d. a kilowatt-hour—in country districts more like twice that amount. Fortunately Mr. Page's remarks on this subject in his address to the Batti-Wallahs' Society last week gained wide publicity; as he said—and as we have insisted many times—economies effected by the operations of the Central Electricity Board will have little influence on the price charged to the household consumer, and they will take years to accomplish. He also laid due stress on the importance of improving distribution, which is essential to the success of the national scheme. The "grid," it is hoped, will render electricity more generally available, but Mr. Page harbours no illusions as to its effects on the selling price of energy.

That the public is at last awakening to the facts may be inferred from recent occurrences in London, where a meeting has been held to protest against the high charges of the County of London Electric Supply Co., Ltd., and "hundreds of correspondents" are said to have asked the *Evening Standard* why one group of Londoners should have to pay twice as much as another group for electrically heating and lighting their homes. Incidentally, the price charged by the County Co. for lighting is said to be 5½d. in London boroughs, but it is really 5½d. plus 30 per cent. (or 7.15d.), and for heating it is not 1½d., but 1½d. plus 40 per cent. (or 2.10d.). In many parts of London, supplied by municipal undertakings, the prices are 4d. and 1d., practically half those charged by the largest company undertaking within the metropolitan area (which, incidentally, is making enormous profits).

Our Oversea Electrical Markets.

Trend of import trade of Australia, New Zealand, India, and South Africa. Factors affecting purchasing power.

IN the ELECTRICAL REVIEW of June 10th there appeared a survey of the economic position of our principal electrical markets, *viz.*, India, Australia, New Zealand, and South Africa, together with charts showing the trend of the electrical trade in those countries. The present situation is now surveyed and the charts are carried another four or five months further. From the latter it will be seen that, except for New Zealand, imports of electrical material in the later months have not kept up their former rate of increase. Yet they have not shown such a decline as the general economic position in certain markets, *e.g.*, Australia, might seem to warrant. Nor has the share of Great Britain in this particular branch of trade decreased to the same extent—small though it is—as, for example, some branches of British trade have declined in India. There seems consequently some justification for supposing that the electrical trade, at any rate so far as the heavy branches are concerned, is less dependent than other business on general trends.

Australia.

Economists and bankers do not regard the position in Australia as wholly satisfactory. The total public debt is £460,000,000, and the present Budget statement, although showing a surplus of £2,635,000, pro-

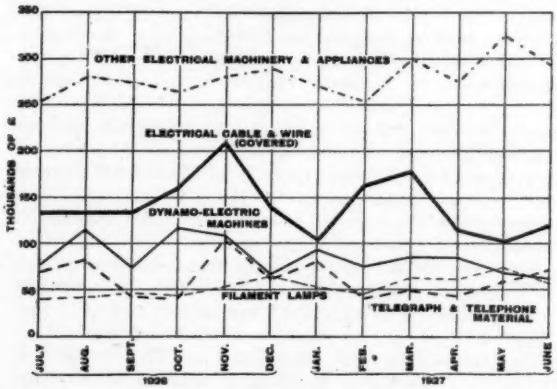


Fig. 1.—Australian Electrical Imports, 1926-7.

vides not more than £6,000,000 for debt redemption. At the same time income tax is to be reduced by a further 10 per cent. It is admitted that the Commonwealth and the States spent more last year than they were able to borrow from the public, but while money is difficult to obtain from Great Britain, loans negotiated in the United States have been over-subscribed. It is so far satisfactory that the danger of the situation is recognised. South Australia has made a praiseworthy move to reduce expenditure, and the Premier foresees a shrinkage of primary exports, although the latest rains have improved harvest prospects.

It may be hoped with some confidence that good will ultimately result from the revelations of the Tariff Board regarding the damaging effect of the increased duties imposed in certain industries. The Board says that there is a danger of the tariff being used to bolster up the ever-increasing cost of production irrespective of any consideration of the ever-widening gaps between the standards maintained in the Commonwealth and the United Kingdom. The disparity affects not only industries using materials wholly produced in Australia, such as iron and steel, but even industries which use an appreciable proportion of imported materials and are at a serious disadvantage in overseas competition.

The quarterly summary of the Commonwealth Statistician shows that the estimated value of production in Australia for 1925-26 was £430,387,000, a decrease of nearly £19,000,000 compared with the previous year. The contributions of the various branches to the total were:—Agricultural, £89,267,000; pastoral, £113,327,000; dairy, &c., £47,161,000; forestry and fisheries, £12,784,000; mining, £24,592,000; and manufacturing, £143,256,000.

Imports during 1926-27 were valued at £164,744,927, and exports at £144,775,541. Compared with 1925-26, imports increased by £13,000,000, while exports decreased by almost £4,000,000. The excess of imports over exports for 1926-27 was thus £19,969,386. Customs and Excise revenue amounted to £43,550,780, an increase of more than £4,000,000 over the total for 1925-26. The chief countries from which goods were imported were: Great Britain and Northern Ireland, £51,663,992; United States, £30,896,342; Netherlands East Indies, £5,035,009; and Japan, £4,126,735.

For the twelve months ended June, 1927, the total value of imports of electrical machinery and appliances was £7,461,000, against £6,154,000. There was an increase of nearly £250,000 in wire and cable and of £150,000 in filament lamps.

It will be abundantly clear from the foregoing that the great potential wealth of the undeveloped resources of Australia remains beyond dispute, and if the powerful labour interests in the Commonwealth could be induced to take saner views and to leave industry and commerce to observe sound economic principles, there would be a more rapid development. In this progress British electrical and other engineering firms are likely to share as widely in the future as in the past. If they are assured of greater stability in tariff matters, together with a continuance of the existing preference, they may look forward with equanimity to their prospective trade in Australia.

New Zealand.

General business conditions in New Zealand show an improving tendency inasmuch as the recent downward movement in the prices of the Dominion's staple

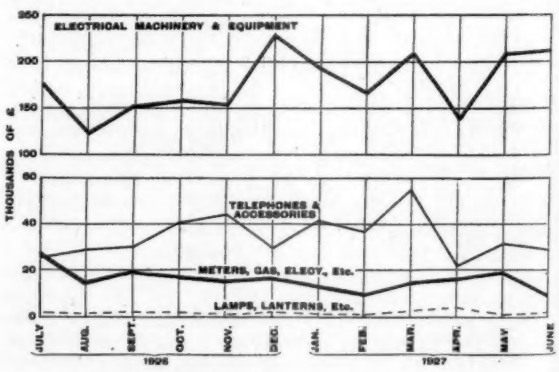


Fig. 2.—New Zealand Electrical Imports, 1926-7.

products appears to have been definitely checked. The result of the foreign trading for the 12 months ended June last has been to place New Zealand in a more favourable position than during 1925-26 to the extent of nearly £5,000,000, owing to a decrease in imports combined with an increase in exports. At the same time it must be admitted that the trade balance has been on the wrong side rather too long, and that consequently the purchasing power of the community has

been affected. For the first six months of this year, however, exports totalled £30,600,000 and imports £22,200,000, leaving an excess of exports of £8,400,000.

Another favourable feature is that building permits, which are to a great extent an index of business activity, after a fall in value in the closing months of 1926, showed a rising tendency with the New Year. Further, the total tonnage of all goods carried on the railways for the latest period for which returns have been issued shows a small but satisfactory advance on the previous year, while the revenue also shows an increase. Gratifying testimony to New Zealand's continued preference for British goods has been given recently. It takes the form not only of more favourable tariff treatment, but also of a widespread inclination to buy British products.

India.

India's foreign trade position during the first three months of the financial year was not quite so favourable as twelve months ago. During the three months ended June last the value of her imports increased by about

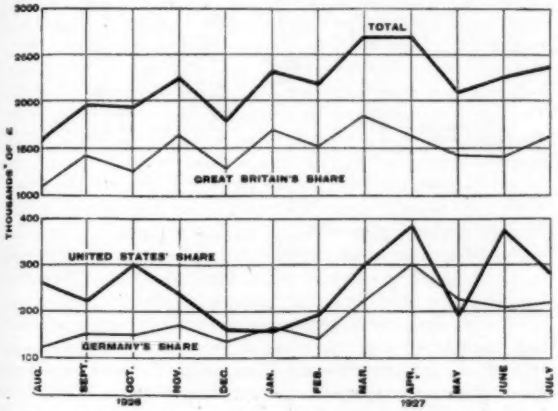


Fig. 3.—Indian Electrical Apparatus Imports, 1926-7.

7 per cent. compared with the same period of 1926, while that of exports of Indian merchandise showed a decrease of 5 per cent. It is true that Great Britain's share of the import trade showed an advance, *viz.*, from £21,000,000 last year to £22,000,000 this year, but it must be remembered that last year's results were abnormally bad owing to the general strike and the coal stoppage. Britain's percentage of the total

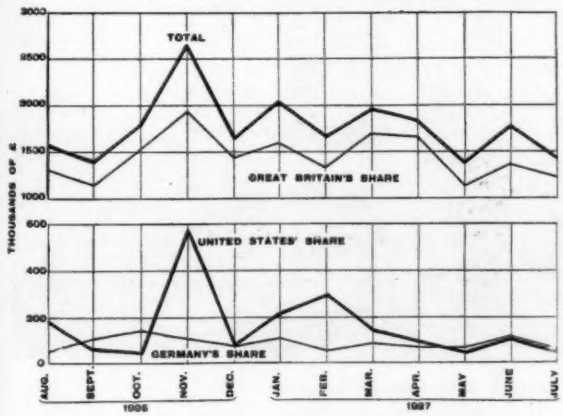


Fig. 4.—Indian Electrical Machinery Imports, 1926-7.

imports fell from 50.7 during the second quarter of 1926 to 49.1 during the second quarter of 1927.

The extent to which the recent falling off in British trade generally with India has been due to the coal stoppage is revealed in the recent report of the India Store Department, a document which contains very much of interest to British engineering firms. The contracts placed by the Department during the past financial year represented a total value of over £10,000,000, or nearly £4,000,000 more than in the previous year, the increase being due chiefly to a heavier demand for railway material and equipment—chiefly electrical. It is satisfactory to learn that the end of the expansion has not yet been reached. Some interesting examples are given of the acceptance of tenders on the ground of superior quality, greater trustworthiness, greater facility of inspection, or quicker delivery in spite of comparatively higher prices. For example, wheels and axles were ordered from British firms in the face of European competition, the successful British firm being in fact the third lowest tenderer.

In the Bombay market for Manchester goods, which is an index of the general trade of the country, a more healthy feeling has recently prevailed, and there has been an improved turnover at stiffening prices. Similarly, the market for local goods has ruled firm, and clearances have been on a good scale.

South Africa.

Some interesting views regarding the commercial position in South Africa were recently expressed by the president of the Durban Chamber of Commerce. He said that a period of over-trading, coupled with the giving of excessive credit, had had a marked effect on the business of the country, and but for the application of a steadying brake, a state of commercial chaos must inevitably have resulted. The tightness of money was due entirely to the policy of the large financial institutions, and it was certain that such a policy would have a salutary effect, with the result that trade would ultimately be placed on a sounder basis.

With regard to import trade, the Union began the year quite satisfactorily, the figures for January show-

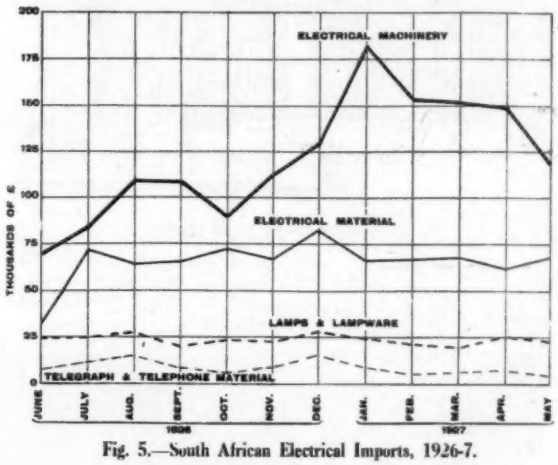


Fig. 5.—South African Electrical Imports, 1926-7.

ing an increase of something like a quarter of a million sterling in value compared with the corresponding month of 1926. Since then, however, importations of merchandise have steadily declined. In both February and March a fall of about half a million sterling was registered, while in April there was a further set-back to the extent of close upon £200,000. Imports in May were about the same as in April, while for the whole five months they totalled £29,630,000, as compared with £30,054,000 during the same period of 1926. Export trade, which in January reflected a decrease of about a quarter of a million, has increased to a very satisfactory extent. In the first five months of this year exports increased by approximately £3,000,000 sterling. Meanwhile the output of gold continues at a relatively high level. In August, in fact, it reached a record monthly total.

The results of the decision of the South African Railways to test out an electric locomotive for freight service will be awaited with interest. Although every maker of note in the world is being invited to tender, there is every confidence that the order will come to Great Britain, whose electrical traction designers have had some notable successes in locomotive work during the past few years. A substantial order is likely to result as soon as the new plant has been tested.

French Electric Ploughing Trials.

Features of Electrical Interest.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E E., F.R.Ae.S.

A VERY interesting series of field trials of electrically-driven and other ploughs recently terminated at Aubergenville, France. The demonstrations were carried out under the auspices of the French Minister of Agriculture (M. Queuille),

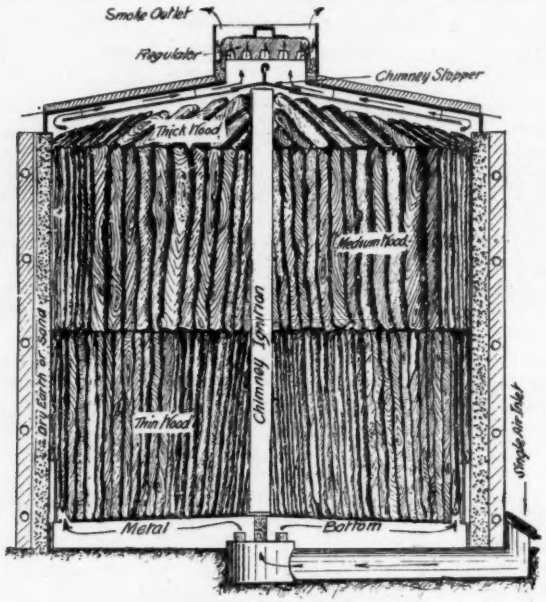


Fig. 1.—Charcoal-making Outfit (Section).

with whom the Minister of War (M. Painlévé) collaborated. The interest of the War Department was founded on the possibiiity of employing farm tractors, in emergency, for war purposes. Coupled with this was the encouragement of the development of portable apparatus for the production of charcoal and of gas producers capable of utilising this home-produced fuel on lorries and tractors, thus affording a possibility of making France independent of outside sources of oil.

Charcoal Plant and Gas Producers.—Twenty-four charcoal outfits were shown in operation, and fifteen gas producers. One of the latter was employed in conjunction with a stationary electric-light engine. Since charcoal, utilised under these conditions, has a fuel economy, it is claimed, of about eighty per cent. in cost over that of petrol, the whole proposition seems to be a very attractive one. The difference in cost cannot be quite as great as that claimed, for undoubtedly more labour is required, *e.g.*, most of the gas producers seemed to require cleaning out about every three or four hours. Further, larger engine cylinders would be required for the same output of power. Still, for isolated country electric generating sets, the system is evidently well worthy of consideration. Almost any scrap firewood can be employed, from twigs to tree branches. The use of charcoal as a fuel for engines has only recently come to the fore with the development of improved means for easily making the charcoal. The methods of the old-fashioned charcoal-burner were not only very extravagant, but also required too much skill. The modern charcoal maker consists of a portable, easily assembled steel structure, which forms a small hut. The wood is cut into two-foot lengths and stacked inside, in a vertical position. The hut, fig 1, is completely filled with this wood, except for a chimney-like space in the centre, which communicates with an opening in the centre of the roof. To start the process, a fire is lighted in the central space, and when combustion is well established in the middle of the wood pile, the roof opening is closed and small apertures around the base of the hut are adjusted so as to admit only a very small quantity of air. Carbonisation then proceeds, and in a few hours the charge is ready, except that it must be allowed to cool. With such plant charcoal making becomes a mechanical process that can be handled by an unskilled labourer.

The Farm Equipment.—The exhibition of apparatus and practical trials took place on a large farm situated some forty miles from Paris. This farm was well equipped with electric light, but only had two electric motors, one for driving the barn machinery through line shafting, and the other a large portable one on skids, with a box cover. The latter motor was in operation crushing chalk for use in the trials of the chalk-spreading machines. It was also utilised at other times for operating a threshing machine.

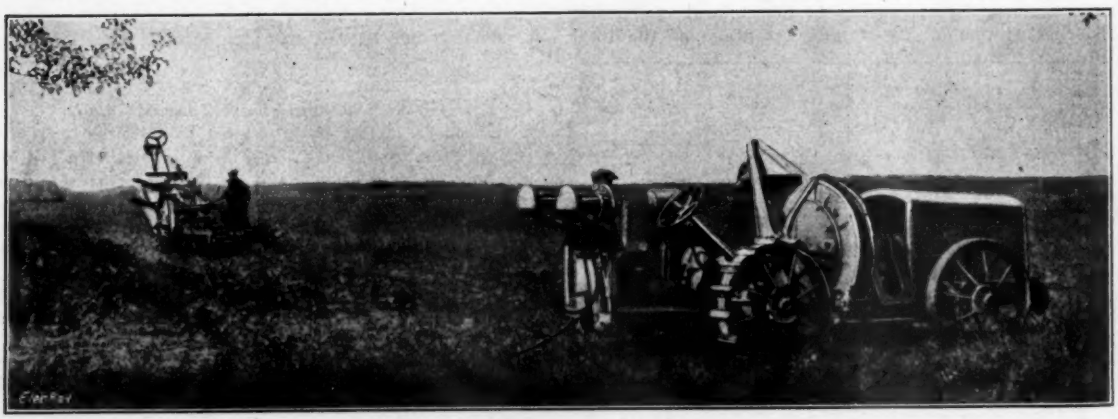


Fig. 2.—Estrade Ploughing Apparatus in Operation.

Homestead and Barn Equipment Exhibit.—In an open-sided cart-shed, the electricity supply undertaking (Nord-Lumière Triphasé), which provided current in the surrounding area, had an exhibit of domestic cooking and heating apparatus and also some examples of barn-machinery drives. The domestic appliances were

characteristically different from those used in this country. Among them was a neat little oven, 10 in. wide by 8½ in. high by 13½ in. deep, which retailed for fifty shillings. The oven door and front were made of vitreous-enamelled cast-iron. The door opened downwards so as to form a shelf. When closed, its own weight on a wedge-shaped catch ensured close contact. Provision was also made to allow for partial opening, to

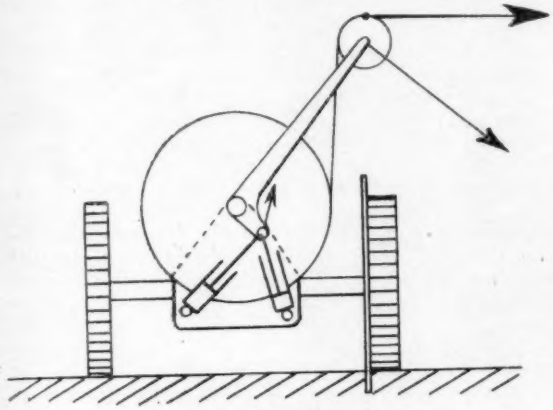


Fig. 3.—Estrade Plough Anchoring.

let out any steam when necessary. The 600-watt heating element was contained within two quartz tubes at the top of the oven, and controlled by a 3-heat switch. It was claimed that it would cook a 3-lb. chicken in 45 minutes at a cost of under one penny for electricity; or a 4-lb. joint of meat in 60 minutes at a cost of just over one penny. Two small beefsteaks required six minutes; a dish of macaroni au gratin could be cooked in 15 minutes.

A novel departure in firewood log saws was a very small one, operated by a motor of only ¼ h.p., running at the high speed of 3,500 revs. per minute, through a reduction gear. The saw was 14 in. in diameter. The feed was automatic, through a spring, the rate being controlled by a valve on a hydraulic oil piston. In fact,

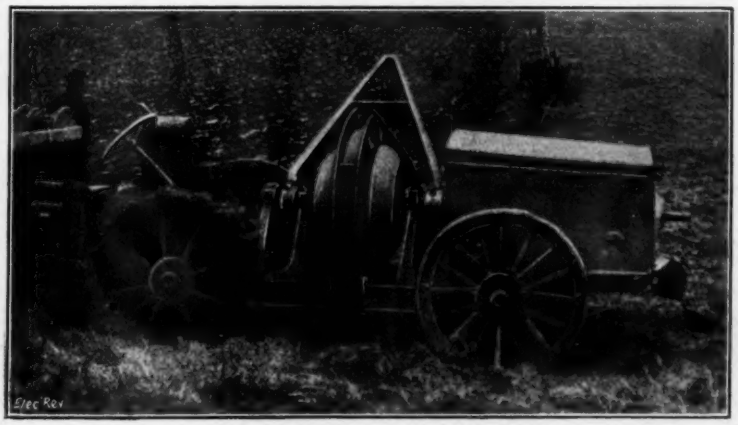


Fig. 4. - Estrade Plough used at the Trials.

it was only the aid of the automatic feed that made such a small appliance practicable.

An automatic high-pressure water pump was exhibited in operation. Its capacity was 45 gallons per hour, at a head of 48 ft., with a consumption of 0.5 kWh. Such pumps are very useful on a farm, since they are very compact, automatic, and quickly fill a bucket of water, due to the pressure of the air tank.

A novelty was an electrically heated shoe for fitting on to existing flat irons of the old-fashioned type. A simple all-metal washing machine was on view. The drive was through two round leather belts on to a worm reduction gear that operated a simple connecting rod; thus the washing barrel made nearly one complete turn in each direction alternately.

A varied collection of small household appliances was displayed. Many of these did not seem very suitable for use by the farmer's wife.

A French Electric Hall-mark.—It was noteworthy that all the domestic apparatus had a special label bearing the letters "AP-EL" and an illustration of a telephone receiver (the latter being a play on the French word formed by the letters). This is the mark of an Associa-

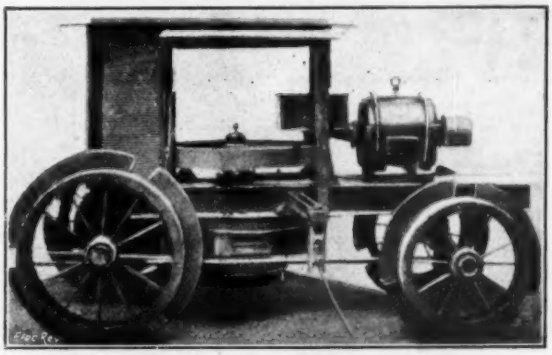


Fig. 5.—35-h.p. S.G.A. Plough Haulage.

tion of central-station authorities, which undertakes the testing and approval of types of apparatus intended for use on their mains. The buyer is thus assured, when a purchase is made of any current-consuming device bearing this badge, that it is a hall-mark as to its standard of quality, and that he is thus protected against rubbishy apparatus, of which so much exists on the Continent. Goods so marked now comprise 200 items, made by 20 manufacturers. The basic idea of instilling confidence and security in purchasers of electrical goods is certainly an excellent one.

Electric Ploughs.—In previous trials (for this affair is an annual event) the large electric ploughs of 80 to 150 horse-power were to be seen. They are, however, now an accepted commercial proposition, hence the interest of novelty is lacking; so this year smaller ploughing equipments of about 35 h.p. were encouraged. Only two entries put in an appearance, the Estrade and the S.G.A. The former has been on the market for several years, and does excellent work. The latter is quite new, though made by one of the most successful European electric-plough manufacturers, who have fifteen years' experience behind them. As with many new appliances, several minor defects prevented this set from fully justifying itself. However, when the slight faults that at present exist are remedied, it should prove a useful implement.

Both sets were of the steel cable haulage type, on the principle of operation of the British Fowler steam equipment, *i.e.*, a haulage gear is placed at each side of a field and, alternately, each draws the balance plough across the field towards itself. At the end of each haulage, the gear is moved forward the width of the furrows ploughed at one time (usually four).

An important feature of the Estrade plough (fig. 2) is its lightness, due to the very ingenious anchoring system employed (fig. 3). The haulage cable passes over a pulley at the end of a pivoted arm. The greater the tension on the cable, the lower will be the position of this arm and the point of application of the pull. The downward movement of the arm is resisted by a system of oil dash-pots, so that for every value of the pull, there is a position of equilibrium, such that the re-

sultant of the pull and the weight of the haulage always passes through the line joining the points of contact with the soil of the two inside wheels. These wheels are fitted with flanges, which, with the rims, enclose a prism of earth. Thus, instead of depending on the friction of the iron rims on the earth's surface, the much greater friction of this compressed prism of earth on that lying beneath is utilised, giving greater stability. It is claimed that such a haulage gear can provide a pull of three times the weight of the set. Ordinarily the pull of a ploughing set is only one-half the weight of the set.

The main motors (of 35 h.p. at 1,440 revs. per minute) were of the squirrel-cage type, and were

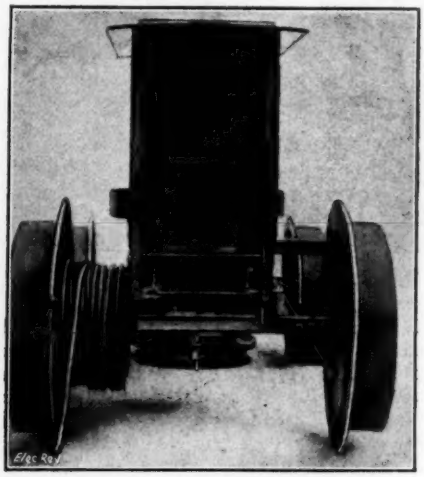


Fig. 6. Rear View of S.G.A. Plough.

operated on a 50-cycle, 3-phase, 600-volt supply. A small separate motor was utilised for moving the haulage gear into place for the next set of furrows to be ploughed. Two speeds were available, 2.75 and 1.83 miles per hour (4.4 and 2.9 km. per hour), *i.e.*, 30 or 18 revs. per minute of the steel-rope drum. The rope was $\frac{3}{8}$ in. in diameter. A difficulty in all electric ploughing sets is to obtain economically a very big speed reduction (in this case from 1,440 revs. to 30 or 18 revs. per minute). For this purpose a planet and satellite system of gears (operating in an oil bath) was employed. These gears were contained within the rope drum.

The makers believe in running flying overhead 600-volt lines alongside the field to be ploughed and then tapping off at alternate posts with a comparatively short length of electric cable by means of a special contact device. Fig. 4 shows one of these ploughing sets in use on a field; the sets are out of sight, the one from another, hence a man has to stand on the crest of the hill to signal to the drivers. This set did some splendid ploughing at the trials. By the way, the rise and fall of the rope guide pulley would give the farmer, who was using such a ploughing set, a good idea as to the fertility of his land, for this varies with the resistance.

The 35-h.p. S.G.A. tackle (fig. 5) weighed nearly four tons, and consisted of a motor with a bevel and spur gear reduction, so as to provide a rope drum, close to the ground level. Through a clutch, the same motor was employed to propel the whole chassis, when required. Fig. 6 shows a rear view of this machine. On the inside of the wheel on the left, the electric cable drum can be seen. This is wound up or uncoiled in accordance with the direction of motion of the vehicle. Half-inch steel rope was employed on this equipment.

A very neat portable transformer cabin was employed with this outfit to transform the line voltage from 15,000 to 600. The meter of the electricity supply undertaking was fitted on the l.p. side of this cabin switchboard, as was an hour meter. The latter type of instrument is exceedingly simple in design, and is employed by a number of French electricity supply undertakings to indicate the period of use of the current, for which an extra charge is made, additional to the rate per unit, of five centimes per kVA-hour.

It is to be hoped that the important question of electric ploughing will be tackled in this country very soon. The load is so great that it is bound to make a great deal of difference in the profitableness of a rural supply. The writer is due to read a paper, which will be illustrated by kinematograph films (as the next best thing to seeing these electric ploughs actually at work) before the Institution of Electrical Engineers on December 1st. This should give an opportunity for discussion—and, it is hoped, sow the seeds for practical application.

Electrical Progress at Home and Abroad.

The author, who has been abroad for some years, compares electrical practice and progress in China, Japan, Canada, and America with recent developments in this country.

By R. A. WILLIAMS, M.C., B.Sc.

RETURNING to England, after some years' absence, from the so-called "old civilisation" of China, and passing through the modernity of Japan, Canada, and America, one is struck by the great differences in the electrical progress that has been made in these countries.

In China there have been great developments in the British concessions and ports, such as Shanghai, Hongkong, and Tientsin. In these ports electricity is more extensively used than in England and, generally speaking, it is also cheaper.

Outside the European settlements in China progress has taken place, but it is greatly hampered by the lack of stable Government, and by the universal "squeeze" practised by all Chinese officials.

In Japan the development of electric lighting is absolutely amazing, for in spite of the poverty of the country there is hardly a single cottage without electric lighting. Whilst travelling in Japan one is never away from the sight of overhead transmission and distribution lines; unfortunately, most of them are of a cheap and untidy construction.

A great deal of the unsightly wiring in Japan is undoubtedly due to the low pressure (110 volts) adopted in conformity with American practice; this voltage necessitates far more transformers than we are used to in this country, and it is quite common to see small transformers on almost every other pole along the streets of Japan, which are made hideous by the network of wires and switches.

In America and Canada there is an ever-insistent call from the public to the electricity companies to keep the street tidy and free from wires and overhead substations; this has been met very largely by a greater

use of the alleyways between the main streets, and also by providing higher-voltage circuits for everything but lighting.

The 110-volt system (which is universal throughout North and South America) is proving a matter of great difficulty as the demand for domestic electricity grows, and many companies are considering the raising of their pressures to 120 or even 135 V; the 110-V system has, however, one real advantage over the 230 volts, and that is its greater safety, particularly when combined with the earthed Edison screw sockets which are now compulsory.

A great deal more attention appears to be given in America to the sale of electrical appliances than is the case in this country. There are certainly far more showrooms, both of the supply authorities and of the electrical contractors; these showrooms are literally crowded with expensive refrigerators, washers, ironers, cookers, &c. In order to effect a sale of appliances and of electricity, the advertising has to be done on a large scale, and I was informed that the electricity companies alone are spending no less than *two million pounds* in newspaper advertising alone during 1927.

In England one notices with a great deal of satisfaction the demand that is springing up from the British public for more and cheaper electricity; this demand is rightly being fostered by the newspapers, particularly the *Daily Mail*, which recognise that the industrial position of the United States is largely due to the greater use of electric power.

A sign of the times is to be found in the standardisation by the Electricity Commissioners of one voltage, one system, one frequency—if they had only added: one wall plug!

It is interesting to note that in 1913 a number of electrical engineers in China met to discuss the possibility of standardising distribution voltages, &c., in that unfortunate country, and the system they settled upon was practically the same as that now so wisely adopted here, *i.e.*, 3-phase, 4-wire, 50 cycles, 440/250 V.

The Commissioners have decided upon a rather odd but useful figure for transmission, namely, 132,000 V; possibly they have the idea that, whilst this pressure is sufficiently high for present-day needs, an increase can be made in a few years by connecting the transformers in delta at present and altering to star when required.

It is stated that the Californian engineers are already sorry that they did not alter their system to 380,000 V (instead of 220,000), as the Germans are already doing.

One feature that engineers from overseas criticise most strongly in this country is the excessive capital outlay in low-pressure distribution. I should not be surprised to learn that in the house that I have taken the service alone cost twenty pounds; there is a heavy two-core cable with a great deal of unnecessary insulation over the neutral, a heavy dividing box, a *double*-pole switch, and a *double*-pole fuse. There is absolutely no excuse for insulation, switches, or fuses on the neutral wire; on the contrary, there should be none, and indeed none is allowed according to the wiring codes used in America, Canada, and New Zealand.

British engineers appear to be very loth to adopt overhead distribution, which would solve many of the problems of costs, and at the same time simplify the work of the mains engineers very considerably, though, of course, it must be granted that overhead lines are not beautiful.

The high price of electricity in this country is largely the result of this costly and over-elaborate distribution system, and engineers would be well advised to urge the greater use of cheap overhead mains, particularly in suburban areas.

In the district in which I am at present residing we are charged 6d. a unit for so many units and 1½d. a unit for all the remainder, for cooking, &c. I consider that the first part of the two-rate is quite correct, for it has to cover the company for all its fixed charges, such as interest, management, iron and copper losses, &c., as well as coal, but the secondary charge of 1½d. a unit is ridiculously high.

I submit that when the consumer has paid all the standing charges covered by the 6d. unit, the remaining units should be sold at a fair profit only over their cost at the generating station, *i.e.*, the cost of (say) 2 lb. of coal, plus copper losses, plus 10 per cent. profit—a total of less than ½d. a unit.

I know from my own experience that if the supply companies were to reduce their rates to reasonable figures they would increase their revenue, and not *vice versa*, and they would certainly increase the sale of electrical appliances.

However many super power stations may be introduced, they will make no appreciable difference in the cost of electricity to the domestic consumer unless the distributors show a wish to reduce rates and also the cost of distribution.

The high price of electricity here is having a decided effect on the export trade from Great Britain, and, if for no other reason, this matter warrants the consideration of the authorities concerned. Oversea engineers are constantly endeavouring to purchase electric cookers, washers, refrigerators, &c., in this country, but with little success. As an example, consider electric cookers. In America and Canada these are entirely made from pressed steel; in England they are still of the cast-iron gas-cooker pattern, and it is not surprising that there is a large sale for the American cookers in the Colonies, whilst the cast-iron patterns are not accepted.

Electric washing machines, ironers, refrigerators, &c., appear to be almost unknown in this country, and they will continue to be unknown unless the various supply authorities push their sale here. I recently asked a manufacturer why he did not make pressed-steel cookers, and his reply was that the electricity rates were generally so high that the sale of cookers was not sufficient to warrant the cost of dies for mass production.

While the importance of the sale of electrical appliances is not sufficiently realised, there is the fiercest competition for turbo-generators, particularly abroad, so much so that a certain German firm has ceased to compete in Australia, as it finds a more lucrative business in domestic vacuum cleaners.

One of the most active electrical societies in America is that started in Toronto and known as the "Red Seal League"; it is a league of electrical contractors, supply men, and others, and its main object is the better equipment of homes in the matter of wiring, &c., particularly wall plugs, of which the standard ruling is "one plug to every fifteen feet of skirting board."

Recently I have been examining a number of nearly-built houses in this district, and have failed to find more than *one plug per house*!

There is the need for some similar society in every town in this country, the members of which should co-operate with each other and the E.D.A. to educate the public electrically, and so promote the sale of electricity, electric washers, cookers, refrigerators, and so on.

Undoubtedly the first and most important thing to be done is to induce the supply authorities to reduce their charges; already some of them are reasonable, as at Glasgow, Manchester, Hackney, &c., but the majority do not realise the importance of low rates. It is to be hoped that, for the sake of British trade, the Electricity Commissioners will soon standardise a two-rate system of charging for electricity, in place of the hundreds of systems that are in use at present; the result will be that instead of putting in 40,000-kW sets in our "super power stations" we shall soon have to install sets of 200,000 kW, or even more.

There is an enormous potential market, both in this country and abroad, for electrical appliances, cookers, refrigerators, washers, percolators, warming pads, bell transformers, and the like, but it is not going to be obtained without exertion and propaganda, and certainly *not with a 1½d. unit.*

Overhead Electric Line Design.

Aspects of Safety and Standards of Construction: A Review of the latest American Practice.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

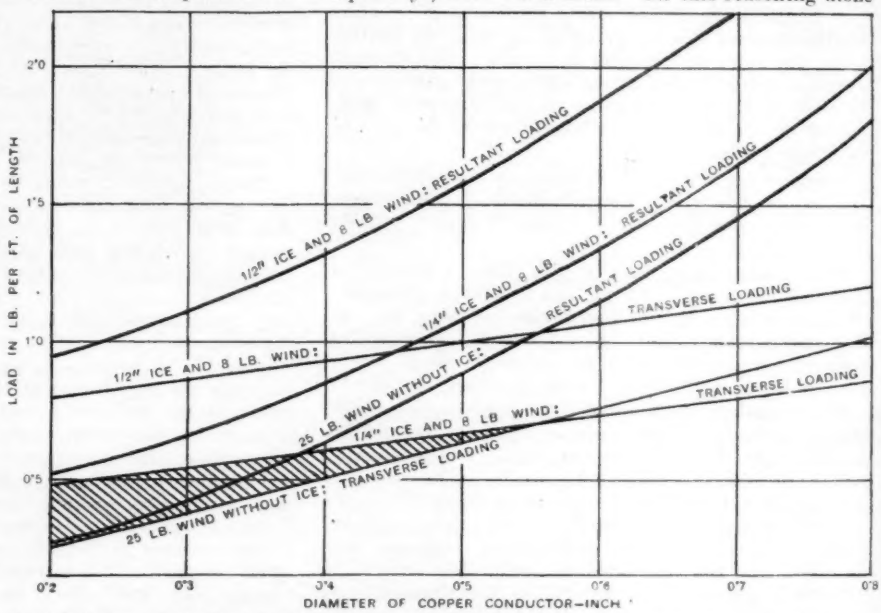
DEVELOPMENT of overhead lines in rural areas, with which this article is principally (but not exclusively) concerned, is by no means a new field of activity. Design and construction theories have been tested in practice for many years, and engineers have long been in a position to adopt some form of standardisation, although the basic principles have changed from time to time due to better knowledge chiefly gained from actual experience, and the final stage of development is certainly not in sight anywhere. At this time it is wise to replace the smaller power stations by a few interconnected central power stations, but if equally important economy in distribution is desired, it is obviously unwise to tolerate the many restrictions now existing, in rural areas in particular.

It is well known that the United States has acquired large experience in the construction and operation of overhead lines, and for this reason it is interesting to note the trend of practice and latest *rules* in force in that country. Experience indicates that the three loading districts into which it has been divided are quite satisfactory. The *heavy* loading is equivalent to the specified loading for *h.p.* lines of this country, yet climatic conditions in the heavy loading district (which covers about half the United States) are far more severe than the worst ever known in this country; moreover, the range of temperatures cannot be compared as the minimum temperature in several places there has reached – 49 deg. F. The *medium* loading district is practically equivalent to the specified loading for *l.p.* rural lines of this country; this medium loading covers the States of Washington, Wyoming, Montana, Oregon, Utah, &c., all of which are subjected to far more severe climatic conditions than are ever experienced here, and some of these States have had for many years overhead lines operating at 100,000 volts and upwards. On the face of these conditions, we obviously have a wide margin of safety. As an indication of the climatic conditions there, we give the following data:—

Locality and State.	Maximum range of temperature in °F.	Maximum velocity of wind (miles per hour)
North Yakima, Washington	– 35 to + 107	96
Cheyenne, Wyoming	– 38 „ + 100	78
Valentine, Nebraska ...	– 38 „ + 107	76
Williston, N. Dakota ...	– 49 „ + 107	72
Helene, Montana	– 42 „ + 103	70
Huron, S. Dakota	– 43 „ + 108	69
Rapid City, S. Dakota ...	– 34 „ + 106	66
Omaha, Nebraska	– 32 „ + 110	66
Des Moines, Iowa	– 30 „ + 110	64
Miles City, Montana ...	– 49 „ + 111	60
Spokane, Washington ...	– 30 „ + 104	52

Reasonable safety may not be easy to define because, excluding the personal equation and other things, it varies with the locality, the probabilities of failure and the limits of risks involved, and it certainly is not wise to close our eyes to what has proved safe, economical and satisfactory elsewhere. The present factor of safety for conductors is the same for both countries, *i.e.*, 50 per cent. of the ultimate tensile strength of the conductor.

Without a shadow of doubt, the U.S. Bureau of Standards has arrived at a sure understanding of the requirements, and it is interesting to note that in the Handbook, No. 10, of "Safety Rules" recently issued by the Bureau, the heavy loading values remain as before, but resultant and transverse loading values for medium and light loadings, respectively, have been reduced, and these therefore especially *favour rural areas*. On this reasoning alone



To obtain the true practical relation of loadings it is necessary to apply the respective factors of safety, namely: 5 or 10 for 25 lb. wind without ice, and 2 or 3·5 for 8 lb. wind with ½ in. (or ¼ in.) ice. From these relations and the above chart values we can visualise and obtain the proper relative loadings, which distinctly show where advantages lie.

Loading and Conductor Diameter.

it is self-evident that we are enabled to arrive at a relative comparison of safety and standards of construction. Climatic conditions, mechanical characteristics of materials, and proper grading of the construction for respective localities and conditions are the criteria in deciding conductor loading and support strength; length of span and increased voltage certainly enter into designs, but from these viewpoints they are secondary. Overhead and other clearances should within certain limits vary with the span and voltage—but there is sure to be controversy in specifying good and safe mechanical loading based on climatic and other conditions, and then limiting it to designs for very low voltage.

As regards the conductor loadings, there is some loose thinking when comparing the late B.O.T. rules with the Electricity Commissioners' requirements. For the same factor of safety the *resultant* loadings on conductors and conductor-supports are less for a loading of 25 lb. horizontal wind without ice—for all sizes of conductors—than for a loading of ¼ in. ice coating and 8 lb. horizontal wind. Also, for the same factor of safety the *transverse* loadings on conductors and conductor-supports are less for a loading of 25 lb. horizontal wind; for copper conductors, the transverse load values for the two loading conditions are practically the same at the 0.2 sq. in. size. Above this size of conductor the advantage in load-

ing is in favour of ½ in. ice and 8 lb. wind, which is the present authorised loading condition. However, we must not overlook the relative factor of safety values; for 25 lb. wind without ice the factor of safety was several times greater than the present authorised loading. *For the same factor of safety* there is much difference in both resultant and transverse loadings between ½ in. ice and 8 lb. wind—for all sizes of conductors—and 25 lb. wind without ice; the loading for equal size of conductor is much less in every case for the former loading condition. Excluding the respective factors of safety, the relative values of loading in terms of conductor-diameter are shown in the accompanying diagram.

The minimum allowable conductor sizes and kind of metal for conductors in U.S.A. are of interest. For the different metals used (see *a*, *b*, *c* and *d* below), it is shown that the minimum conductor size varies with the loading district, with the length of span, and with the grade of construction—all of which have been found necessary for safe and economical construction. For the medium loading district with which we are especially concerned, because it is practically the equivalent of the specified loading for this country, *i.e.*, ¼ in. ice and 8 lb. wind, we have:—

Span length in feet.	Size of conductor in sq. in. for rural and urban areas.			
	(a)	(b)	(c)	(d)
150	·0 3	·013	·0 6	·0240
200	·0 3	·021	·083	·0 83
3·0	·033	·033	·0 3	·0383
400	·033	·033	·083	·0383

where :- (*a*) = Copper medium and hard drawn
(*b*) = Copper-covered steel.
(*c*) = Aluminium without reinforcement.
(*d*) = Steel-reinforced aluminium.

In the case of wood poles the Bureau of Standards rules of 1921 allowed a fibre stress equal to half the assumed ultimate strength. An improvement over these rules has been made which still further *favours construction in rural areas*. The allowable fibre stresses are varied according to the grade of construction and whether poles are located at crossings or in other places. For line construction in rural areas the allowable fibre stress is greater for all places, which means a smaller size of pole than formerly allowed. The loadings on conductor-supports are easier than the former rules; the vertical loads are the same (but these are of little import), and the transverse loadings for medium and light loading districts are much less, and these especially favour rural areas.

The allowable fibre stress for wood poles is 75 per cent. of the ultimate fibre stress for crossings and 100 per cent. elsewhere than at crossings for grade C construction, which grade refers to supply lines of voltages ranging from 750 to 5,000 V between conductors. The transverse strength for this grade is not less than two-thirds of that required for grade B; this grade is for urban areas, and is superior. The minimum pole top diameter for both grades of construction is 6 inches. The ultimate fibre stress values have not been altered, therefore the allowable fibre stresses for the different timbers are a decided advantage for rural lines in particular. For this country, with much less severe climatic conditions to contend with, 7,800 lb./sq. in. fibre stress and 3.5 for factor of safety are taken, or 2,230 lb. allowable fibre stress for red fir creosoted poles. Therefore, assuming that the ultimate fibre stress value of red fir is reasonable, as also that of yellow pine and other timbers used for poles in the U.S.A., the relative percentage fibre stress allowable at the present time for *rural* areas and for voltages up to 750 V is:—

Location.	Relative allowable fibre stress.	
	British.	American.
At crossings	40%	100%
Elsewhere	28·5%	100%

In other words, taking the British at 100 per cent., the American is 250 per cent. for crossings and 350 per cent. elsewhere. Also, in urban areas for voltages up to 7,500 V the relative allowable fibre stress is:—

Location.	Relative allowable fibre stress.	
	British.	American.
At crossings	57%	100%
Elsewhere	50%	100%

That is to say, taking British at 100 per cent., the American is 175 per cent. at crossings, and 200 per cent. elsewhere than at crossings.

Note.—Dense yellow pine is 6,500 and western red cedar is 5,000 lb./sq. in.

As with wood poles, the allowable unit stresses for steel poles and towers vary according to the grade of construction; the allowable stresses are also different for transverse strength and for longitudinal strength, which latter values are varied according to the different grades of construction, as well as according to whether crossings or other conditions are considered. The ultimate tensile stress is given as 50,000—65,000 lb./sq. in., and the yield point not less than half the ultimate stress—equivalent to a factor of safety of 2.0. The slenderness ratios for compression members remain as before. A thickness of ⅛ in. is not allowed; other thickness values remain as before, with the exception that where experience has shown rapid deterioration of galvanised material, ¼ in. is the minimum allowable thickness for main members of legs and crossarms. According to the grade of construction and whether at a crossing or elsewhere, the allowable unit stresses range as follows:—

Allowable stresses for:—	Tension (lb./sq. inch).	Compression (lb./sq. inch).
Transverse strength ...	20,000—30,000	20,000—80 L/R to 30,000—100 L/R
Longitudinal strength in line	33,000	33,000—100 L/R
Longitudinal strength at crossings	30,000	30,000—100 L/R

The ability of a tower to resist its loading depends largely on properly designing and making the foundation and footing—the principal loads being horizontal. The allowable unit stresses on bolts and rivets are given as:—

Unit.	For transverse strength (lb./sq. inch).	For longitudinal strength (lb. sq. inch).	
		Crossings.	Elsewhere.
BOLT: Bending	40,000—70,000	70 000	80,000
Shear	20,000—35,000	35,000	40,000
RIVET: Bending	36,000—60,000	60,000	66,000
Shear	18,000—30,000	30,000	33,000

The minimum horizontal separations between conductors are made a little greater in the revised U.S.A. rules; they are given in terms of sag. With reference to the vertical overhead clearances of conductors above ground, they remain the same as before, with the exception that for a span of 50 yd. the clearance increase *is less*. This, again, *favours rural lines* quite independently of the following values, which are for spans of 50 yd. and under:—

Minimum overhead clearance for line pressures up to 750 volts.		
Across roads and streets in rural and urban areas.	*Along* streets in urban areas.	*Along* roads in rural areas.
18 feet.	18 feet.	15 feet.

NOTE.—The previous rules permitted this vertical overhead clearance of wires above ground for a maximum of 300 volts to earth, NOT 750 volts, between conductors, which is the present rule.

As these are rules based on wide experience under climatic conditions far more severe than exist here, and proved by a long term of years to be safe and reliable, and subjected to relatively greater vehicular traffic, to lower factors of safety, to safe standards, to less restrictions, &c., is it not reasonable to look for modifications of the rules and restrictions in this country for lines of similar voltage in rural areas?

Economic Progress in Electricity Supply.

A two-part diagram visualising the whole of the charges of the electricity supply industry for one year, or showing the comparison between a number of years, drawn up from the statistics contained in the Electricity Commissioners' Returns.

By D. J. BOLTON.

THE detailed statistical returns of the Electricity Commissioners, of which two have been published, covering the four years 1921-4, have rendered available an enormous mass of valuable facts regarding electricity supply in this country. Unfortunately it is extremely difficult for the ordinary individual to gather up these facts into an organic whole, and form a correct mental picture of the average position. Rows of figures are apt to mean little except to the expert, and he frequently is unable to communicate his knowledge. Even when such a mental picture has been formed, it is by no means easy to compare it with that of a later year, and to see exactly how much, and at what points, progress has been made.

Another difficulty which confronts the student anxious to obtain a through grasp of the economics of electricity supply in this country is that whilst the mean over-all price per unit is given for the whole of the energy sold each year, the actual prices charged by the undertakings are in most cases not uniform flat rates, but vary either with the individual consumer's load factor, or else with his class of load, and therefore probable load factor. In order to understand the position clearly, it is therefore necessary to deduce from the figures supplied what is the charge (say on the basis of a two-part tariff) which would correspond, for a consumer of the average load factor, to the actual over-all figures given, and yet which would accurately reflect the various expenses of the supply for the year in question.

The object of the present article is two-fold—to present the figures (split up into two components, in the form of an ordinary two-part tariff) in diagrammatic form in such a way that they can be immediately visualised, and then to juxtapose the results for several different years so that they can readily be compared with one another, point by point. For this purpose the author has developed a special type of illustration, called a two-part diagram, in which the various quantities are displayed in a semi-pictorial fashion, based on a division of the costs and charges into two components. This will be used ultimately to compare the supply conditions for several different years, but in the first place only a single year will be considered, namely, that ending December, 1922, in the case of the companies, and March 31st or May 15th, 1923, in the case of the municipalities (Return issued June, 1925).

Referring to the diagram itself, fig. 1, it will be seen that it is divided into two parts by a horizontal zero line. Above this are shown all those expenses and loss items which are directly proportional to the kilowatt-hours, and the scale of this part of the diagram is in pence per unit. Below the line are shown all standing or overhead charges and every item dependent upon demand and independent of the actual consumption, the scale of this portion of the diagram being in £'s per annum per kW of demand. These two components are different in kind and must be plotted quite separately. They cannot be added except on the basis of some known load factor, and yet it is important to plot them side by side since they are affected similarly (though not equally) by such items as losses in the plant and cables. In the diagram the left-hand side represents the generating end and the right-hand side the consumers' end of the system, and the two groups of costs can be considered as flowing from left to right,

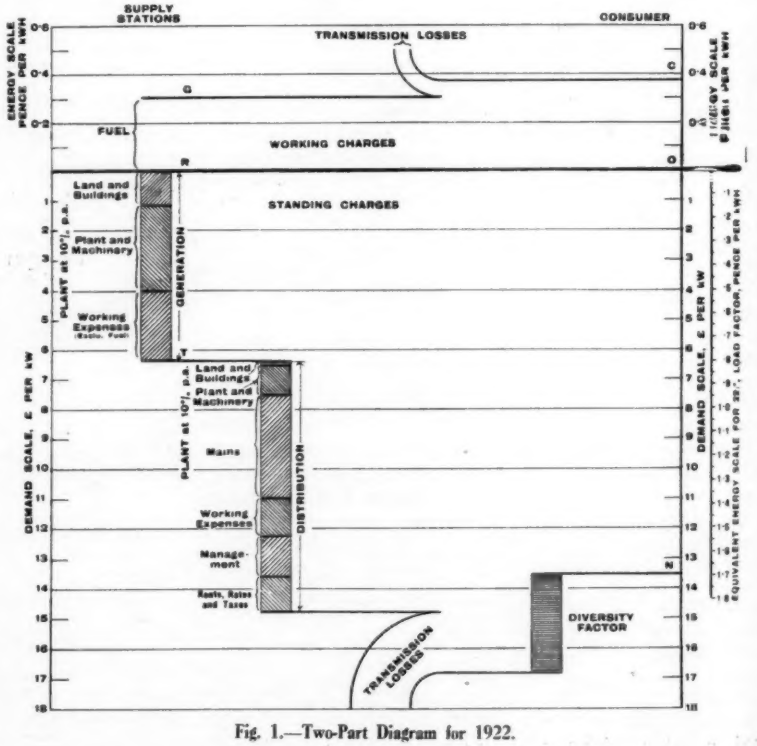


Fig. 1.—Two-Part Diagram for 1922.

being swollen by the various losses and additional expenses incurred on the way. The two components therefore advance in parallel through the system, and they can at any point be added together, if the load factor be known, into an over-all price per unit.

The first step is therefore to divide all the expenses detailed in the Commissioners' Return into two groups. This division must be to some extent arbitrary, and in the figures employed below the whole of the fuel is put into the energy section and all the other expenses are included in the other group. This involves errors in both directions, since a small amount of fuel is used in keeping the plant "banked" ready for use, whilst on the other hand many of the smaller items, such as oil and water, are more or less dependent upon the

output. Moreover, as will be seen below, the percentage assigned to the capital items includes in some cases a certain amount of profit which might fairly be distributed over both standing and running groups.

Referring to the Returns for 1922, 4,500 million units were generated at a total fuel cost which worked out at 0.31d. per kWh, and this is therefore shown above the zero line on the left of the diagram. Of these units only 3,780 millions were sold, the difference, *i.e.*, 16 per cent., covering the various losses in conversion, transmission and distribution. This has the effect of increasing the price to the consumer to 0.37d. per unit (top right-hand side of diagram), and it is shown in the diagram by means of a cost tributary coming in above the zero line and between station and consumer.

Turning now to the items below the zero line, comprising every expense except that of fuel, these are not quite so easy to deal with. In the first place there is some difficulty in separating the generating from the transmission and distribution expenses, since some items (management, rates, &c.) are not split up in this way, but refer to the undertaking as a whole. A more serious difficulty is that some items are capital ones which must be expressed per annum, so that they can be added to the others. As regards this difficulty, the return shows that for the year in question the excess of the receipts over the working expenses amounted to just 10 per cent. of the outstanding capital expenditure, the figures for the two later years being 9.65 and 9.01 per cent. respectively. This excess is spent in various ways. Most of it is required for interest and depreciation charges on the plant employed; with interest at 5 per cent., and apparatus having a useful life of twenty years, this would amount to 8 per cent. per annum. The remainder may be considered as distributed in dividends or going towards additional debt redemption, according to whether the undertaking is a company or a municipality. For the purpose of the present article it is, however, impossible to split this excess up in detail, and it will therefore be assumed that each item of capital expenditure involves in its provision and replacement an amount each year of 10 per cent. of its first cost.

Dividing this amount by the total maximum demand on the generating stations gives the annual expense per kW of demand, and this is set off vertically below the zero line on the left-hand side of the diagram. Adding the working expenses of generation (excluding fuel), which must also be expressed per kW of demand, gives the total standing charge for generation, namely, £6 7s. per kW per annum (R T)*. To a bulk consumer purchasing from the generating station, the correct price, *i.e.*, the figure which would be adequate to cover all the expenses detailed in the return, is therefore represented by the ordinates RG, plus RT, namely 0.41d. per unit consumed, plus £6 7s. per annum per kW of demand.

As regards the latter, or standing charge, there are two errors in this, fortunately in opposite directions. In the first place, the items of management, rents, rates and taxes, which are given in aggregate for the enterprises as a whole, are here grouped with the transmission and distribution costs (see on), although they should be spread over generation as well. On the other hand, the sum of the maximum demands of consumers purchasing at the generating station would be more than the total maximum demand on the station owing to their diversity factor, so that the charge per kW should be correspondingly less. If the diversity factor is 1.20, and if the total management, rents, &c., are divided up in the same proportions as the capital and working charges, the amount assigned to generation will almost exactly balance the effect of the diversity factor. Hence the ordinates GRT may be said accurately to reflect generation costs for the year 1922.

* The costs of transmission and distribution are similarly assessed, on a basis of 10 per cent. per annum on the capital costs, plus the actual working expenses, to which are added management, rents, &c., each item being expressed as per kW of station demand. As these expenses occur after generation and, in fact, somewhere on the journey between the station and the consumer, they are shown a short way to the right in the diagram. Before it is possible, however, to assess the correct price to the consumer, it is necessary to modify the total now reached on account of two items—the transmission losses and the diversity factor.

As regards the losses in transmission, &c., these decrease the kW capacity to meet the consumers' demand in the same way that they decrease the available units, but not quite in the same ratio. This is owing to the fact that, with apparatus having iron and frictional losses, these cause a loss of energy throughout the 24 hours, whereas the kW capacity is affected only by full-load conditions. Hence the capacity to meet the demand is reduced only in the ratio of the full-load efficiency, whereas the energy delivered is reduced in the ratio of the all-day efficiency, which will be less (in apparatus other than cables) by an amount depending on the low-load losses and the load factor.

In this case the reduction in kW capacity is taken to be 12 per cent., and the price per kW of demand is correspondingly increased from £14 15s. 7d. to £16 16s. per annum. This is represented by a cost tributary coming into the diagram below the zero line, and it is shown in the diagram to the right of the generation and distribution expenses.

The existence of a diversity factor, or rather of a series of diversity factors, between the consumer and the generating station will mean that the sum of the consumers' demands will be considerably in excess of the maximum demand which ever comes on to the station. Hence the capacity of the system to meet individual consumers' demands is virtually increased in the ratio of the diversity factor, and the price per kW of demand will be correspondingly reduced. This is shown on the diagram by horizontal shading, and, assuming a total effective diversity factor of 1.25, the price per kW of consumers' demand will be £13 10s. per annum (OX)*. This ordinate, together with the energy charge of 0.37d. per unit (OC) will then give the total consumers' tariff.

The mean load factor on the generating station plant is given in the Return as 28 per cent., but the average consumers' load factor will be less than this for two reasons, the diversity factor and the difference between the loss in kW, and the loss in units. With the figures assumed above, this will bring the average consumers' load factor throughout the country to approximately 22 per cent. The feature of the diagram in question is that for any particular load factor the ordinates below the zero line can be expressed as a price per unit and so added to the ordinates above the line. Thus, for a load factor of 22 per cent., each £1 per annum demand charge will represent $240/.22 \times 365\frac{1}{4} \times 24 = 0.125$d. per unit, and on both the diagrams here shown the lower scale has been so chosen that at this load factor it represents prices per unit to the "energy" scale. Thus, the diagram represents to scale the exact condition for the "average" consumer in this country, and a glance at the equivalent energy scale on the lower right-hand side will show that the standing charge is equivalent to 1.7d. per unit for a consumer having a 22 per cent. load factor. This, when added to the energy charge of 0.37d., gives a total of 2.07d., which was the actual mean price for the energy sold during that year.

The diagram therefore illustrates a two-part tariff which is adequate for looking after all the costs of supply, as deduced from the Return, whatever may be the load factor of the consumer. It also shows to scale this same cost expressed as an overall price per unit for a consumer having a particular load factor, the price thus indicated being the actual mean charge for the whole country, and the load factor being the mean for the country as deduced from the Return.

(To be concluded.)

* These figures seem high, but it must not be forgotten that they represent averages for the whole country, small stations with big, and include domestic consumers as well as power.

St. Pancras Electricity Works.

Official inauguration of a 12,500-kW Brush-Ljungström turbo-generator, the largest set of that particular type to be installed in this country.

SINCE our last outline of the developments that have taken place at the metropolitan borough of St. Pancras electricity generating station,* further additions have had to be made to the plant. Mr. Sydney W. Baynes, M.I.E.E., chief electrical engineer, now has six Brush-Ljungström steam turbo-alternators in his station, of an aggregate capacity of 31,500 kW.

The new set (fig. 1), together with all its accessories, was installed by the Brush Electrical Engineering Co., Ltd., and is the largest of its kind in this country. Its output is 10,000 kW at its most economical load, and it generates at a pressure of 5,050/5,300 volts, when the turbine is supplied with steam at a pressure of 200 lb. per sq. in. at the stop valve, superheated to a total temperature of 688 deg. F., and is capable of developing an overload of 25 per cent. continuously.

The turbine is of the usual double rotation type directly coupled to two alternators, having a combined output of 12,500 kW; a direct-coupled exciter is provided, and the whole of the regulation of the alternators is effected by means of the exciter field only; arrangements are also provided for separate excitation, if necessary. All the main bearings, including the governor gear, Michell thrust devices, &c., are lubricated by oil under pressure, delivered by a rotary pump driven through worm gear from the main shaft, and drawn through a strainer and air cooler of the straight-tube surface type. A steam-driven pump assists when starting, and it can be automatically started and connected to the system in the event of the oil pressure falling below a predetermined value; a further safeguard is auxiliary oil pots so arranged that in the event of the failure of either of the oil pumps, sufficient oil will be supplied to the bearings, &c., to enable the plant to be shut down. Separate emergency stop and throttle valves are provided, and the main centrifugal governor controls the movement of the throttle valve by means of the usual pressure-relay system. Provision is made for speed adjustment to be made, not only at the turbine by hand operation, but also from the switchboard by electrical gear.

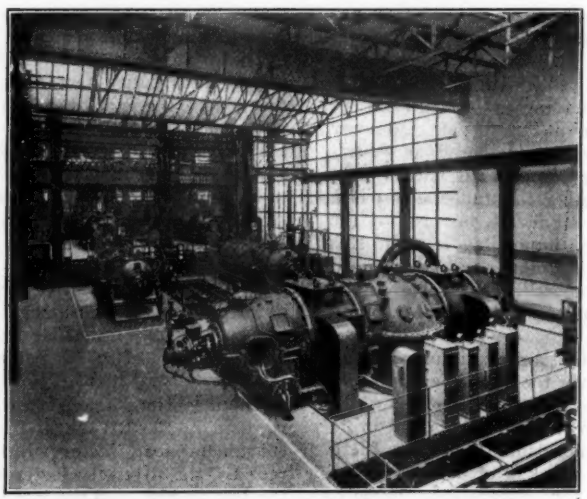


Fig. 1.—Engine Room. New Machine in Foreground.

The condenser is of special design and carries the turbine and alternators, thus saving foundation costs; it is of the Brush two-flow surface type, and is capable of maintaining a vacuum of 28½ in. with a constant supply of water at a temperature not exceeding 70 deg. F.; the tubes are of 70/30 Admiralty mixture, each 15 ft. long. Air is extracted from the condenser by means of a Brush-Delas ejector, which is fitted with a surface feed-heater in order to regain the heat from the steam used in operating the nozzles. The condensate is extracted by means of "Pervac" water pumps in duplicate, installed by Messrs. Drysdale & Co., Ltd.; each is capable of dealing with the full duty when running at a speed of 1,500 r.p.m., and discharging against a total head of 55 ft.; they are driven by 17-b.h.p. motors.

The alternators are ventilated on the closed circuit system, a separate cooler and fan being provided for each alternator. Air alarms and emergency inlet and outlet dampers are provided, the whole of this equipment having been provided by Messrs. Heenan and Froude, Ltd. Each of the centrifugal fans is driven by a motor at 1,100 r.p.m., and will deal with 25,000 cu. ft. of air per min.; the fans were supplied by Messrs. Standard & Pochin Bros.

The whole of the motors for driving the various auxiliaries were supplied by the Brush Electrical Engineering Co., Ltd., the necessary switch and control gear having been supplied by Brookhirst Switchgear, Ltd.

Three galleries accommodate the switchgear, separated from the engine-room by glass screens. The e.h.p. gear is of the totally-enclosed type manufactured by Messrs. Reyrolle & Co., Ltd., the whole of the gear being electrically operated from control panels. Automatic voltage regulators are provided, as also means of emergency switching on the driving platforms of every turbo set. The switchgear controlling the 220- and 440-volt local distributing systems was supplied by Messrs. J. G. Statter & Co.; on the same gallery are situated the house service boards, from which independent circuits control the electric motors driving the auxiliaries for each boiler and each turbine.

The total capacity of the boiler house is 440,000 lb. of steam per hour at 230 lb. pressure, superheated to 700 deg. F. There are, in all, eight boilers, four fired by means of mechanical stokers and four by the "Lopulco" system with pulverised fuel. Each boiler is provided with forced- and induced-draught fans, superheaters and economisers.

The condenser circulating water is taken from the Regent's Canal, a pump-house being situated on the bank, and returned into the canal; three Rees Roturbo electrically-driven pumps are each capable of delivering 750,000 gallons per hour; foreign matter is extracted from the water by three revolving screens, and the water is also chemically treated in a chlorinating plant to prevent the formation of vegetable growth.

All make-up feed water to the boilers is treated chemically to remove hardness, and the condensate water is also de-aerated before being returned to the boilers.

In addition to the converting plant installed at King's Road generating station, four sub-stations in the supply area contain motor convertors and two Brown, Boveri rectifiers of 900 kW each, *i.e.*, 22 sets aggregating 23,800 kW.

Following the starting ceremony at the generating station, which was performed by the Mayor (Councillor the Rev. R. Congers Morrell), the Electricity and Public Lighting Committee entertained the visitors at luncheon at the Midland Grand Hotel.

* ELEC. REV., November 14th, 1924.

Legal.

Alleged Fraudulent Prospectuses.

ON November 3rd, at the Mansion House, adjourned summonses were heard against Sir Charles Buckworth-Herne-Soame, Bt., Col. Edmund Octavius Eaton, and Robert George Harley, charging them with conspiring together and with others to defraud such persons as might receive prospectuses issued by the Chalk Fuel Power Gas and By-Products Corporation, Ltd., and to obtain money from them by representing that reports which appeared in the prospectuses were true and were made by those purporting to have made them.

Mr. PERCIVAL CLARKE, prosecuting, said that Sir Charles Soame and Mr. Harley were directors of the company, but Col. Eaton was not. The company was registered in March, 1914, with a nominal capital of £16,000, to take over inventions relating to the manufacture of fuel gas and the utilisation of chalk in the production of gas. In 1914 Mr. G. H. Franklin, chief engineer of Haig's Distillery, was asked to report upon a new fuel which was to supplant coal and was made of chalk and cinders. He reported that it was unsatisfactory. Two other gentlemen reported adversely upon it, but, stated Counsel, the prospectuses contained statements, alleged to have been made by these gentlemen, claiming a number of virtues for the fuel. Evidence was given by Mr. J. R. Belcher, one of those who tested the fuel, and the hearing was adjourned until November 17th.

Piper v. Metropolitan Electric Tramways, Ltd.

THIS case, which occupied the attention of Mr. Justice Horridge and a special jury for several days, was concluded on October 31st; the jury disagreed and were discharged. It was a claim for damages alleged to be due to the negligence of the defendant company's employés during the general strike in May last year. The plaintiff stated that a wagon belonging to him was overturned by a tramcar driven by volunteers, but the defence alleged that the trouble was due to deliberate obstruction by the driver of the wagon.

Compensation for Electrical Fitter's Widow.

AT the Staffordshire County Court on November 4th, Mrs. Louisa Halden, Stafford, was awarded £300 compensation against the Stafford Corporation, in respect of the death of her husband, William Halden, whilst following his employment as a fitter in the Electricity Department. This was due to the bursting of an aneurism on the brain, but there was a conflict of testimony as to whether it was caused by an accidental fall or whether the fall was due to the bursting of the aneurism in the ordinary course of the disease.

In making the compensation award, Judge Ruegg, K.C., granted the statutory additional amount in respect of the applicant's children under the age of 16, and allowed costs on Scale C. He granted a stay of execution on condition that £100 was paid into court within 21 days, remarking that he would advise careful consideration before an appeal was entered.

Compensation for Electrical Injury.

THE Court of Session action in which a boy sued the United Collieries, Ltd., Glasgow, for £1,000 damages for personal injuries, has been settled. Between the collieries of the company are overhead lines carrying current at a high voltage. The boy was walking along a pathway near some of the poles when he inadvertently touched a projecting wire which was intended to act as the lightning conductor at a pole. The plaintiff averred that the wire was broken and that it was charged with electricity, because the insulation of one of the cables was defective. He received a severe shock and was badly burned. In the terms of the settlement plaintiff has accepted £150, and the action has been taken out of court.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A. Circle Campaign.

Last week 5,500 people visited the "all-electric house" at 11, Osborne Terrace, Edinburgh, and as one result over £33 has been handed over to the Royal Infirmary. The exhibition is being continued under the auspices of the Corporation Electricity Department and the proceeds will again be devoted to the Infirmary.

Each week numerous additions are being made to the Campaign lecture panel and many interesting lectures are given in all parts of the country. Lists received from the E.D.A. indicate that all kinds of interests are receiving lectures on electrical matters through their associations and social organisations.

An Electric Week Offer.

In connection with the National Electric Week (December 3rd to 10th), which is dealt with on another page, Messrs. L. G. HAWKINS & CO., LTD., offer to assist electrical dealers to conduct advertising campaigns of their own. On the condition that they display "Universal" appliances exclusively in their windows, the company offers dealers a varied collection of publicity matter and will defray half the cost of advertisements in local newspapers. In addition they offer selections of "Universal" appliances and electric window signs upon special terms.

American Industry in Canada.

The Toronto correspondent of the *Chamber of Commerce Journal* says that the economic encroachment of the United States into Canada continues. Some 1,400 branch factories of American industries have been established in Canada, and this total is being steadily increased. The capital involved runs into substantial figures, and a sizeable portion of Canada's workmen are dependent upon alienated American industry for their livelihood. Analysis of the reasons for this peaceful encroachment provides interesting conclusions. In a number of cases, branch factories are directly due to the desire of the company to exploit the Canadian market, and this cannot be done successfully through ordinary trade channels because of tariff restrictions. Then again the existence of preferential tariffs within the Empire provides a lure, which impels American manufacturers to come to Canada in order to exploit the tremendous British markets to the best advantage. Canada is to-day the second-best customer of the United States, ranking next to Great Britain, and she maintains this position, despite the existence of protective trade barriers. Raw materials and partly-finished goods are a substantial factor in the trade returns.

The Lord Mayor's Show.

In accordance with its usual practice, the Eastern Telegraph Co., Ltd., participated in last Wednesday's Lord Mayor's Show. The company had two cars, one bearing a picture of the s.s. *Great Eastern* laying the Atlantic cable in 1866, and the other a painting of the company's *Dominia*, a most modern cable-laying ship.

The Marconi International Marine Communication Co., Ltd., entered a marine wireless tableau showing a lifeboat sending signals for assistance. This was preceded by the company's banner.

From 1901 until the present day no fewer than 6,000 British merchant ships have been fitted with Marconi apparatus. At the present moment over 15,000 ships throughout the world are equipped with wireless telegraphy apparatus, of which 3,396 are British ships, and nearly 3,000 of the British ships are fitted with Marconi apparatus.

Another tableau with an electrical element in it was that of the Master Sign Makers' Association.

Armstrong, Whitworth's Difficulties in New Zealand.

The Auckland correspondent of the *Financial News* states that, following his pronouncement in Parliament on November 4th on the Arapuni power contract dispute, the Premier, Mr. Coates, has declared that the Government is willing to accept a reasonable compromise. If the power house foundation is such as no reasonable man could have expected, he says, the Government would be reasonable regarding the increased cost. Negotiations are proceeding between the Attorney-General, Mr. Rolleston, and the legal adviser of the contractors, Armstrong, Whitworth & Co., Ltd.

New Ilkley Showrooms.

Alderman W. Walker, of the Central Electricity Board, opened on November 3rd new electricity showrooms and offices, which have been erected by the Ilkley Urban District Council. The building, which is close to the Town Hall buildings, has been designed by Mr. E. L. Gaunt to accord with the architecture of the Town Hall, and affords spacious provision for its purpose. On the ground floor are two large showrooms for the display of electrical appliances of all kinds, with commodious offices for the clerical staff in the rear. A broad staircase, with handsome oak railing and oak newel posts, leads to the first floor, where, amongst other accommodation, is a well-lit drawing office, the electrical engineer's office, committee room, waiting room, and storerooms. Mr. W. B. Dornan, chairman of the Electricity Committee, introduced Alderman Walker, who was presented with a gold key to open the door, by Mrs. E. J. Jarvis, wife of the Ilkley electrical engineer. Mr. Dornan presided over a banquet at the Middelton Hotel, in the evening, when the guests included representatives of the West Riding County Council and many neighbouring authorities.

A "Kelvinator" Window.

The accompanying illustration shows a bright window in Kingsway, W.C.—that of Kelvinator, Ltd. It should be noted that the "lady" is actually only a flat cardboard figure. The detail of the whole picture is emphasised in a very noticeable manner. The window is illuminated with Frink "Silverlite" reflectors, spaced 12 in. apart. The focusing collar

The Kelvinator Window in Kingsway.

supplied on these very materially assists in obtaining correct illumination. The collapsible metal collar can be correctly lengthened or shortened in accordance with the filament of the lamp that is being used. Another advantage of the "Silverlite" is that it is all metal. Actually a sheet of solid silver is first of all pressed out and then copper is electrolytically deposited on the back for strengthening purposes. By this method it is found that peeling and tarnishing are impossible, and, the reflector being made of metal, there is no fear of breakage.

The French Electrical Industry.

Dealing in a French financial organ with the grievances of the French electrical manufacturing industry in connection with the effects of the Franco-German trade agreement of August, 1927, a correspondent points out that the German Reich has been granted the minimum tariff on all articles except lamps. Such a concession is said to open the French market specially to German heavy electrical plant. On the other hand, the Reich, for various reasons, is closed to the French electrical industry: two large firms have a monopoly, and the national sentiment is in favour of preference being given to the national industry, as in England. The correspondent claims that the French works are claimed to be able to compete with those of neighbouring countries. Possible deficits in the home market, it is considered, could be compensated for by a fresh expansion in the exports if the banks would afford the facilities.

The Cardiff Engineering Exhibition.

The annual Engineering Exhibition at the Drill Hall, Cardiff, organised by the South Wales Institute of Engineers, is to be held this year from November 23rd to December 3rd. The catalogue which we have received contains the names of a number of companies of national importance, including some of the leading electrical manufacturers.

An Industrial Heating Exhibition.

The Industrial Heating Committee of the British Electrical Development Association is arranging to hold a specialised display of industrial electric heating appliances. This will probably take place in January next at the new power station of the Poplar Borough Council. The London supply undertakings will co-operate with the E.D.A. in sending out invitations to interested firms and persons. Provincial sub-committees are being formed with a view to the organisation of similar exhibitions in other parts of the country.

A Vickers-Armstrong Amalgamation.

The directors of Vickers, Ltd., and Sir W. G. Armstrong, Whitworth & Co., Ltd., announced last week that an agreement had been negotiated between the two companies for the amalgamation of the principal branches of their business, *i.e.*, those engaged in naval shipbuilding and heavy steel and armament production. It is understood that the commercial and subsidiary businesses of both companies will not be directly affected by the arrangement.

Both companies were carried on with conspicuous success before and during the war, but after that period difficulty was found in employing the greatly-extended establishments, while the capital had risen to an enormous extent. Vickers, Ltd., underwent a capital reconstruction in 1925, and the financial position of the company is now sound. The Armstrong-Whitworth board has intimated that a reconstruction is also necessary in that company's case. The economies which will be effected by amalgamation are expected to improve considerably the prospects of the concerns. A new company is to be formed to take over the companies' interests as from January 1st next year.

Proposed American Cable Merger.

Plans for a $50,000,000 merger of five wire and cable manufacturing companies with plants throughout the United States into the General Cable Corporation are announced. In the consolidation are the Safety Cable Co., the Standard Underground Cable Co., the Rome Wire Co., the Dudlo Manufacturing Corporation, and the Sheet, Rod and Wire Mills of the Baltimore Copper Smelting and Rolling Co.—*Reuter's Trade Service* (New York).

Jugo-Slav Duty on Radio Apparatus.

Under the recently-signed commercial treaty between Germany and the Serb-Croat-Slovene Kingdom, the duties upon a number of German goods on importation into the Kingdom have been reduced. Among them is radio apparatus of all kinds, the reduced duty on which is 230 gold dinars per 100 kg. This applies equally to goods from the United Kingdom.

Trade Announcements.

Mr. B. N. Addey, for over 21 years with M. Lowrance and Son, has commenced business as an electrician, &c., in Queen Street South, Barnsley.

Messrs. Barratt Bros. are opening new showrooms at 30, Baxtergate, Whitby, Yorks. They ask for catalogues of electrical fittings, power plant, heating apparatus, &c.

Messrs. Ibbotson Bros., electrical and wireless engineers, have opened new premises at Doncaster Road, Rotherham.

New Catalogues and Lists.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1.—An illustrated and priced folder containing particulars of a number of fires of the company's manufacture.

The Macintosh Cable Co., Ltd., St. James's House, St. James's Street, S.W.1.—A profusely illustrated booklet describing in detail the company's industrial wiring system and fittings and accessories.

Vac-Tric, Ltd., The Broadway, Cricklewood, N.W.—Two illustrated pamphlets advertising the company's vacuum cleaners.

Messrs. Marryat & Scott, Ltd., 57, Hatton Garden, E.C.1.—A leaflet, illustrated in colour and photographically, advertising the company's electric lifts.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—November stock list of motors and dynamos.

Messrs. Baxter & Caunter, Ltd., 219, Tottenham Court Road, W.1.—November catalogue of electrical accessories and appliances, including fires, lighting fittings, switches, "sunray" apparatus, &c. Illustrated and priced.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—A leaflet advertising the company's fuse for the protection of valve filaments. Illustrated and priced.

Messrs. Verdon Cutts & Co., Ltd., 87, Fargate, Sheffield.—An illustrated and priced pamphlet dealing with the company's sheathed metal electrode for welding.

The Ever-Ready Co. (Great Britain, Ltd.), Hercules Place, Holloway, N.7.—A comprehensive illustrated price list of the company's dry batteries and accumulators for radio work, and accessories.

The Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.—A brochure illustrating and describing very fully the construction of "Foster" transformers and kiosks.

The Hendon Electric Lamp Co., Ltd., 104, Southampton Row, W.C.1.—A series of illustrated price lists advertising the company's electric lamps and domestic appliances.

Brook Motors, Ltd., Empress Works, Huddersfield.—A mailing card advertising for sale second-hand factory plant from the company's works.

The Electrical Equipment & Carbon Co., Ltd., 109-111, New Oxford Street, W.C.1.—List M9, illustrating examples of rheostat control apparatus for lifts, &c.

The Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—Publication No. 1123, describing, with illustrations, the "Plenum" system of ventilating and heating by means of the company's apparatus.

The Wholesale Fittings Co., Ltd., 23, 25, 27 and 37, Commercial Street, E.1.—Three illustrated and priced leaflets describing the company's "Silchrome," "Supastone," and "Artopal" lighting glassware.

Winding-up Petition.

NORTON WIRELESS CO., LTD.—A petition for the winding-up of this company has been presented to the High Court by Impex Electrical, Ltd., and will be heard in London on November 15th.

Bankruptcy Proceedings.

A. H. SMITH, 13, Station Road, Penarth, near Cardiff, late Park Place, Cardiff, electrical distributor.—The first meeting of creditors was held on October 28th at Cardiff. The statement of affairs showed liabilities of £658, against assets of £54, leaving a deficiency of £604. Debtor attributed his failure to want of capital, depression in trade in the district, and the inexperience of his late partner. A resolution was passed accepting the debtor's offer of a composition of 5s. in the £.

B. B. WASTRELL, manufacturers' agent, 56, Buckingham Gate, S.W.—This bankrupt entered into partnership with another person in June, 1923, with a view to selling a radio valve which his brother was perfecting; he advanced about £250 to his brother, but it was discovered that the valve infringed existing patents, and it could not be placed on the market. The bankrupt failed in November, 1924, with liabilities of £174. On November 4th he applied at the London Bankruptcy Court for an order of discharge, which was granted subject to a suspension of four weeks.

W. H. COX and J. M. SANTOLINI, trading as Cox & Santolini, electric sign makers, 179, Old Street, E.C.—This firm failed in July, 1926, and last week the bankrupt Cox applied to Mr. Registrar Warmington at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the provable claims amounted to £465, and no assets were disclosed. The failure was attributed to lack of capital and insufficiency of profits to meet drawings. The discharge was suspended for three months on statutory grounds.

H. C. WINGFIELD, electrician, 47, Carholme Road, Lincoln.—First meeting held November 10th, at the Official Receiver's offices, 10, Bank Street, Lincoln. Public examination, December 1st, at the Sessions House, Lincoln.

G. BLADES, electrical engineer, 55, Hainton Avenue, and 52, Pasture Street, Great Grimsby.—Last day for proofs for dividend November 16th. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby.

H. WILSON (deceased), electrical contractor, 56, Woodhall Avenue, Thornbury, Bradford.—First and final dividend of 10½d. in the £, payable at the Official Receiver's offices, 12, Duke Street, Bradford.

G. TURNER, trading as the Radio Supply Co., 34, Mesnes Street, Wigan, electrician and wireless dealer.—Trustee, Mr. E. D. Symond, Official Receiver, 11, Dale Street, Liverpool, released October 25th.

J. SPAVEN, 51, George Street, Bradford, electrical and mechanical engineer.—First and final dividend of 3s. 1d. in the £, payable at the Official Receiver's offices, 12, Duke Street, Bradford.

W. G. H. MORLEY, trading as George & George, 434, Market Place, Higher Broughton, Salford, electrical contractor.—Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester, released October 25th.

J. E. W. ARCHER, 259, Crookes, Sheffield, watchmaker and wireless dealer.—Trustee, Mr. L. J. Clegg, Official Receiver, 14, Figtree Lane, Sheffield, released October 26th.

H. NUTTALL, trading as J. A. Hartley & Co., 1073, Chester Road, Stretford, electrical agent and factor.—Receiving order made October 31st, on debtor's own petition.

J. WORSLEY, 10, Green Street, Darwen, electrician.—Trustee, Mr. H. Parker, Official Receiver, 11, Winckley Square, Preston, released October 26th.

AMOS & WRIGHT, electrical and motor engineers, 32, Slater Street, Liverpool.—Receiving order made October 27th on a creditor's petition.

Company Liquidations.

THOMAS GUNN, LTD., 30, Fore Street, E.C., and elsewhere.—The statutory meeting of creditors was held on November 2nd. Mr. F. H. Bennett, the liquidator in the voluntary liquidation of the company, occupied the chair, and stated that so far as he could ascertain the liabilities amounted to approximately £25,798, made up as follows: trade creditors, £18,521; sundry claims, £277; Mrs. Gunn, £2,000; and debentures, £5,000. The assets were estimated at £12,496, leaving a deficiency of £13,302. The company was registered in 1907 to take over the business of Mr. Thomas Gunn. The nominal capital was £15,000, of which £12,606 had been issued. The trading results had fluctuated considerably. A private conference of the largest creditors had already been held, when a proposal was made that 6s. in the £ should be accepted by the creditors. The principal creditors decided that the creditors generally should say whether the offer should be accepted or not. Mr. Cork said that none of the creditors desired a realisation. His view was that if the fixtures and leases were included, the value of the assets would be considerably increased, and the estate would show more than 6s. in the £. He did not think that the scheme proposed was acceptable to the creditors generally. A resolution was passed confirming the voluntary liquidation of the company with Mr. Bennett and Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., as joint liquidators, together with a committee consisting of Messrs. W. H. Cork, E. H. Hawkins, and W. Gibson, and the representatives of the General Electric Co., Ltd., J.P. Supplies, Falk, Stadelman & Co., Ltd., and Purser & Co. The following are creditors:—

	£		£
Abol Co.	182	Gibson, W.	418
Brown Bros.	140	Harris, J. F. & G. ...	121
British Thomson-Houston Co., Ltd. ...	374	Hunt, Barnard & Co....	228
Condrup & Co... ...	277	J.P. Supplies	254
Cooper, Stuart & Co....	155	Minnis & Minnis ...	116
Ever Ready Co. (Gt. Britain), Ltd. ...	183	Purser & Co.	1,335
Falk, Stadelmann & Co., Ltd.	607	Ramsey & Co.	341
Fordham & Co. ...	226	Ransomes, Sims & Jefferies, Ltd.	625
French & Co.	268	Siemens & Co.	234
General Electric Co., Ltd.	825	Sloan Electric Co. ...	412
Godiva Engineering Co.	932	Skelton, C. T., & Co....	108
Gross, Sherwood & Co.	194	Trice & Chapman ...	120
		Victory Fencing Co. ...	270
		Wilmot & Co.	265
		Warne & Co.	283

PRESTOGRAPH SIGN WORKS, LTD., Hampstead Road, N.W.1.—A meeting of creditors was held on November 4th, when the liquidator, Mr. Moody, stated that the deficiency as regarded the debenture holders was £764. The trade creditors' claims amounted to £97, and there was no prospect of their receiving any dividend. The deficiency as regarded contributories was £2,838. No resolutions were passed, and the liquidation of the company will therefore be continued with Mr. Moody as liquidator.

MONTREAL TRAMWAYS & POWER CO., LTD.—A general meeting of members is called for December 5th in Montreal to hear an account of the winding up from the liquidator, Mr. F. H. Strouvelle, 24, Lombard Street, E.C.3.

BROLT, LTD.—A general meeting of members is called for December 5th, at 15, Newhall Street, Birmingham, to hear an account of the winding up from the liquidator, Mr. C. H. Smith.

EASTON LIFT CO., LTD.—A general meeting is to be held at the offices of Messrs. Thorne, Lancaster, Farey & Reacher, 46, Basinghall Street, E.C.2, on December 5th, to hear an account of the winding up from the liquidator, Mr. H. G. Holmes.

E.I.C. MAGNETOS, LTD.—A meeting of members is called for December 5th, at 15, Newhall Street, Birmingham, to hear an account of the winding up from the Liquidator, Mr. A. B. Waring.

Dissolutions of Partnership.

MARSH JONES & CRIBB, furnishers, electrical contractors, &c., Leeds and London.—Messrs. G. P. Sixsmith and P. Whaley have dissolved partnership.

THE GRANGE ROAD ENGINEERING WORKS, general and electrical engineers, 14, Beauchamp Road, Upper Norwood, S.E.—Messrs. G. M. Southam, W. J. Eade, and J. W. Bonfield have dissolved partnership. Messrs. Southam and Eade will attend to debts and continue the business under the same style.

Local Exhibition.

BIRMINGHAM.—Excellent results are reported by Messrs. Parker, Winder & Achurch, Ltd., in connection with their All-Electric House at Edgbaston. The number of visitors since the opening has averaged 2,500 per week, and is increasing. The demonstrations of cooking and cleaning by electricity, which are given daily, have occasioned much interest. The company is arranging a special wireless week, from November 14th to 26th, during which demonstrations will be given with receivers operated from the mains.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during September last were valued at £33,833, as compared with £31,686 in the corresponding month of 1926. The aggregate imports during the first nine months of the year are returned at £279,889, as compared with £327,687 in the corresponding period of 1926, a decrease of £47,798.

For Sale.

Edinburgh Electricity Supply Department invites offers for 20 tons scrap high conductivity copper wire. *Re* Clay Installations, Ltd. Mr. H. E. Clark, of Messrs. Clark, Battams and Co., 4, Clement's Inn, Strand, invites offers for the stock-in-trade, plant, &c. Mr. H. J. Shaw will sell by auction on November 24th, at 31-31a, Camden Street, N.W., a stock of wireless and electrical goods, &c. (See our advertisement pages to-day.)

A Motor Trade Development.

It is reported that Messrs. S. SMITH & SONS (MOTOR ACCESSORIES), LTD., have acquired the business of the Robinhood Engineering Co., sparking plug manufacturers.

Book Notices.

We have received a copy of the Diary issued by the Association of Engineering and Shipbuilding Draughtsmen for the coming year. It contains many useful engineering data, and information concerning all branches of engineering, including electric cranes and electrical engineering, in addition to considerable general information, the calendar, memoranda, and diary proper.

"Transport Management," No. 9, October, 1927. Price 6d. —This is described as "the British journal of trade and transport," and it reviews a number of topics in connection with these subjects.

"*Punch* Almanack, 1928." 1s. net.—This annual herald and brightener of winter is again to hand, and, as usual, contains a great deal of clever, artistic and witty drawings and matter.

"Proceedings of the Institution of Railway Signal Engineers," Part 1, 1927 (February to August). Price 7s. 6d.

Messrs. David Brown & Sons (Huddersfield), Ltd., have published, at the nominal price of 1s. each, three treatises on "Worm Gearing," "Double-Helical Gearing," and "Spur, Spiral, and Bevel Gearing," which cover the field in a most comprehensive manner. The works are profusely illustrated.

The German Electrical Industry.

It is reported by a German correspondent that the situation of the electrical industry in general continues comparatively satisfactory. The seasonal decline in orders, which usually takes place during the summer months, has only manifested itself quite recently in most departments. However, abundant orders are said to be on hand for generators, transformers, cables and wires, this also applying to the export trade.

Social Events.

Members of the staff of the Helsby and Prescot works of the British Insulated Cables, Ltd., met at the Adelphi Hotel, Liverpool, last week for the annual dinner. After the annual meeting of the Staff Guild, dinner was served, followed by a concert and dance.

A staff and employès' dance was given by the directors of the Mullard Companies on October 28th, at the Royal Horticultural Hall, Westminster, about 1,200 guests being present. A presentation of an inscribed gold cigarette case was made to the managing director, Mr. S. R. Mullard.

New York Electrical Exhibition.

Over 25,000 articles are on display at the annual Electrical and Industrial Exposition now being held at New York. The exhibits show the application of electricity in innumerable fields, including lighting, heating, power and therapeutics. One of the most interesting exhibits is the "preferred" home lighting equipment, in which nearly 40 manufacturers of lighting fixtures have co-operated. The exhibit shows various types of artistic lamps for the home, and is arranged in a three-room suite—living-room, dining room, and bedroom. This is the first time a co-operative exhibit of this kind has been shown at the Exposition.—*Reuter's Trade Service* (New York).

Recent Contracts.

Messrs. ALFRED HERBERT, LTD., Coventry, are supplying the pulverisers for the new super-power station which is being erected at Hams Hall, near Birmingham. This station when completed will have a capacity of 800,000 kW. There will be at the outset five large boilers, each having a capacity of 200,000 lb. of steam per hour, and each of them will be fired by five large double "Atritors," as the Herbert pulverisers are called, each double machine having a pulverising capacity of 4 tons of coal per hour, making the total capacity of the plant 100 tons per hour. The "Atritors" will be electrically driven and will be electrically-controlled from a distant station. The fuel used will be of a cheap quality and somewhat high in moisture; the "Atritors" will pulverise and dry this fuel and impel it into the furnace without requiring any independent dryers or other apparatus.

The Southern Railway is proceeding with an extension of the colour-light signalling system which has proved very successful. The extension embraces the lines in the neighbourhood of London Bridge station and is estimated to cost about £150,000. The material is being supplied by the WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., but the work of installation will be carried out by the railway company's own staff.

Unemployment.

During the week ending October 24th there was a slight increase (2,700) in the number of unemployed. The total was 1,074,000, as compared with 1,071,300 on October 17th and 1,516,170 on October 25th, 1926 (coal dispute period).

The German Cable Industry.

Discussing in a Cologne newspaper the future prospects of the German cable industry, Herr G. Zapf states that it is at present very well occupied for the home market. The requirements of many electricity works, which were only satisfied to a very limited extent during and since the war, have necessitated considerable extensions, and this has been augmented by the changing over from direct to three-phase current. When this demand fails a great deal of work will be provided by the conversion of overhead lines into underground cable systems. In the l.p. cable branch favourable prospects also exist. After a long period of depression business in insulated wires has revived an account of greater activity in the building market. Herr Zapf expresses regret at the establishment of competitive undertakings in the cable industry in surrounding countries, which can only be met by superior technique. In the case of submarine cables manufacturing is at present in a state of stagnation owing to the paralysis of the German marine cable policy caused by the war, and through the conflict of opinion as between cables and radio-telegraphy. The situation in the wire branch is not very favourable owing to the falling-off in sales as compared with 1913, and the considerable decline in export possibilities.

New Indian Companies.

Among the concerns recently organised in connection with electricity supply in India are the Rajshahi Electric Supply Co., 36, Central Avenue, Calcutta, capital 300,000 rupees; and the Hinganghat Electric Supply Co., Hinganghat, Central Province, capital 150,000 rupees.

New Italian Companies.

Among the electrical engineering concerns recently organised in Italy are La Società Costruzione Apparecchi Elettro-Domestici, Milan, capital 100,000 lire; La Società Elettromeccaniche Campioni Botteon, Piacentini & Co., Milan; La Società Industria Nazionale Apparecchi Electtrici Universale, Milan; and La Società Applicazioni Elettromeccaniche, Catanzaro.

Prices of Materials.

Messrs. James Forster & Co., reporting on the lead market on November 5th, stated:—"Arrivals during October were about 20,000 tons, so that, with consumption running at about 19,000 tons, and allowing for exports, there would appear to have been little surplus. The future is more obscure than ever, but it does not seem that any improvement in consumption will now be seen this year, while there are no signs yet of any serious curtailment of production."

Messrs. F. Smith & Co. report, November 8th:—Copper (electrolytic) bars, £63 10s., 12s. 6d. inc.; do. do. sheets, no change; do. do. wire rods, £73 10s., 12s. 6d. inc.; do. do. H.C. wire, 9 3/16d., 1/16d. inc.

Messrs. James & Shakespeare report, November 8th:—No change in rubber prices; English pig lead, £21 10s., 15s. dec.

Messrs. Edward Till & Co. report, November 8th:—No change in the price of india-rubber Para fine.

Lighting and Power Notes.

Australia.—SYDNEY (N.S.W.).—We have received from Mr. H. R. Forbes Mackay, city electrical engineer, a copy of his report, together with the statement of accounts on the working of the city electricity undertaking for the year ended December 31st last. The total revenue amounted to £1,870,989, as compared with £1,700,454 in the preceding year. Working expenses amounted to £1,236,355, as against £1,045,704, leaving a gross profit of £634,634 (£654,750). Interest, contribution to sinking fund, and provision for depreciation, absorbed £673,070, there was therefore a net deficit of £38,436, as compared with a surplus of £53,608 in 1925. The capital expenditure during the year amounted to £1,318,957, the chief items being £570,173 for underground mains, £70,098 for overhead mains, £141,479 for land and buildings at Bunnerong power house, and £292,833 for sub-stations. The electrical energy generated amounted to 220,110,900 kWh, and 71,316,680 kWh was purchased from the New South Wales Railway and Tramway Department. The sales of electrical energy increased from 202,424,951 to 234,608,942 kWh, and the maximum supply demanded from 71,380 to 80,700 kW. The average price obtained per kWh fell from 1.915d. to 1.799d. The number of consumers connected at the end of the year was 147,504, an increase of 17,166. Work was commenced in January, 1926, on the erection of the Bunnerong power station. The first section will include six 25,000-kW turbo-alternators, and 18 100,000-lb. boilers. Totals of 71 miles of underground h.p. mains, 75 miles of overhead and underground l.p. mains, and 31 miles of additional street lighting mains were put into service. During the year 12 static transformer sub-stations were added to the system.

MANLY (N.S.W.).—The report of the municipal electrical engineer (Mr. A. J. Bradshaw), on the working of the electricity undertaking for the year ended December 31st last, records a total revenue of £38,693, as compared with £34,750 in the preceding year. Working expenses amounted to £21,007, as against £17,312, leaving a gross profit of £17,686 (£17,438). After payment of capital charges there was a net surplus of £6,921, as compared with £6,594 in the previous year. The Council obtains a bulk supply of electricity from Sydney City Council, and the total sales increased from 1,589,472 to 1,965,826 kWh.

Batley.—ASSISTED WIRING SCHEME.—The Town Council has adopted the principle of an assisted wiring scheme, and particulars of a scheme are to be submitted for consideration.

Berkhamstead.—STREET LIGHTING.—The Rural Parish Council has accepted the tender of the Chesham Electric Light and Power Co., Ltd., for public lighting at Potten End for a period of seven years.

Birmingham.—ELECTRICITY SUPPLY PROGRESS.—At a recent meeting of the Electric Supply Committee it was reported that the sales of electricity during the September quarter showed an increase of 16¼ per cent., as compared with the

corresponding period of last year, when conditions were abnormal owing to the effect of the general strike. Nearly 2,000 additional consumers were connected up to the mains.

Brigg.—ELECTRICITY SUPPLY.—The Urban District Council contemplates applying for powers to generate electricity and has declined to support the proposals of the Scunthorpe Council to supply a large area in North Lincolnshire with electricity.

Brighton.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £52,000 for mains and services.

Canada.—ELECTRICAL DEVELOPMENT.—In order to provide additional capacity at Shawinigan Falls, Quebec, and to balance better the hydraulic plants on the St. Maurice River, the Shawinigan Water & Power Co. will immediately begin construction of the seventh unit in power house No. 2. This unit will be 45,000 h.p. and a duplicate of the last unit installed.

Chelmsford.—PURCHASE OF UNDERTAKING.—The Town Council on October 26th decided to offer to purchase the undertaking of the Electric Supply Corporation, Ltd., for a sum of £60,000.

Clayton (Yorks.).—PROGRESS OF SCHEME.—At a recent meeting of the Urban District Council it was reported that main and subsidiary cables for the Council's new electricity supply had been laid, and that work on the erection of the overhead supply cable was about to be commenced. The applications for supply up to date numbered 117.

Continental.—BELGIUM.—The Compagnie d'Electricité de la Dendre, in its report for the year ending June 30th last, recently issued, states that it is now supplying electricity to 25,138 consumers in 77 communes, the sales last year amounting to 20,309,380 kWh, as compared with 18,673,990 kWh in the preceding twelve months. A new 7,000-kW steam turbo-alternator is shortly to be put in operation at the power station. During the past year 17 miles of new h.p. and 7 miles of l.p. mains were laid, bringing the totals up to 223 and 277 miles respectively.

FRANCE.—La Compagnie d'Electricité de Limoges is about to commence work on the erection of a 20,000-V transmission line between Charroux and Nexon in the Department of Haute Vienne.

Elland.—ASSISTED WIRING SCHEME.—The Urban District Council has decided to introduce an assisted wiring scheme in order to encourage the domestic use of electricity.

Finchley.—ELECTRICITY SUPPLY.—The Urban District Council Electricity Committee has discussed with Hornsey the possibilities of a mutual arrangement for the maintenance of an electricity supply with existing plant. Further negotiations are to take place and meanwhile the Committee is urging for sanction to an application for a loan of £24,000 for plant extensions.

Gillingham (Kent).—LOAN.—The Town Council has applied for sanction to a loan of £5,000 for mains and services.

Guatemala.—ELECTRICAL DEVELOPMENT.—The A.E.G., of Berlin, has recently completed the equipment of a small hydro-electric power station with a capacity of 232 h.p. at Sierra, Province of Zacapa. The same company has also constructed a 14,000-h.p. station at Quezaltenango to utilise the power of the river Samala.

Hull.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £77,000 for sub-station equipment.

Kendal.—OPPOSITION TO SCHEME.—Ratepayers, at a recent meeting, protested against the Corporation's application for sanction to an additional loan of £30,000 for extensions to the electricity undertaking, and passed a resolution demanding a full investigation of the offer of a bulk supply from the Carnforth waste heat station.

Kingston-on-Thames.—ELECTRICITY SUPPLY.—The Town Council has received sanction to put in hand, at an estimated cost of £3,000, work in connection with the supply of electricity in the Fife Road area.

Kingussie.—STREET LIGHTING.—An electricity supply for street lighting was recently inaugurated, although the contract is not quite complete. The lighting is being installed in the burgh by Messrs. Balfour, Beattie & Co., for the Grampian Electricity Supply Co.

Lincolnshire.—ELECTRICITY SCHEME.—Preliminary steps have been taken to apply for an Order for the whole of Lincolnshire, except those parts already covered by certain authorities. Arrangements will be made for the co-operation of local authorities concerned in the financial aspects of the matter. A general survey of Lincolnshire has already been made and shortly one of a more detailed character will be undertaken. The distribution of the supply will be under the auspices of a public utility company with a capital of £200,000, to be increased later to £1,500,000. The scheme has been submitted informally to the Electricity Commissioners and to the chief engineer of the Central Electricity Board, and its main features are understood to have met with their approval. Dr. A. Ekström and Mr. R. Borlase Matthews are acting as consulting engineers for the scheme.

Maidstone.—LOAN.—The Town Council has applied for sanction to a loan of £1,871 for a transformer to be installed in the sub-station in Boxley Road.

Plympton St. Mary.—INQUIRY.—An inquiry was recently conducted by Mr. Gordon Tucker, for the Ministry of Transport, into the Rural District Council's application for compulsory way-leaves for overhead distribution along the main roads within the area of its new electricity scheme. The Council's case was put before the Inspector by the clerk, Mr. Percy T. Loosemore, and the consulting engineer, Mr. Arthur Ellis, of Cardiff, and after the hearing the Inspector went round the district.

PROGRESS OF SCHEME.—Good progress is reported in connection with the erection of the distribution station at Plympton and the laying of the many miles of transmission and distribution cable throughout the Council's area, parts of which, it is anticipated, will be able to receive their first supply of electricity before Christmas.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SOUTHEND-ON-SEA.—Lighting: From 6½d. to 5½d. per kWh.

BATLEY.—The tariff for restricted-hour users from 100 to 80 per cent. above the basic rate.

PORTSLADE AND SOUTHWICK.—Heating and cooking: From 2d. to 1½d. per kWh.

SOUTHWARK.—The increase of 10 per cent. imposed owing to the coal dispute to be discontinued.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Power Development Co., Ltd., to supply electricity in the urban district of Rugeley and parts of the rural districts of Lichfield and Stafford; Ripon City Council to supply in the city and part of the rural districts of Ripon and Wath; Basingstoke Corporation to supply in parts of the rural districts of Basingstoke, Kingsclere, and Whitchurch; Weymouth and Melcombe Regis Corporation to supply in the rural district of Weymouth, and parts of the rural districts of Dorchester, Wareham and Purbeck; and the Dawlish Electric Light & Power Co., Ltd., to supply electricity in parts of the rural districts of St. Thomas and Newton Abbot.

The Minister of Transport has confirmed a Special Order made by the Electricity Commissioners authorising the County of London Electric Supply Co., Ltd., and the North Metropolitan Electric Power Supply Co., to give reciprocal supplies of electricity.

The Clyde.—TRANSMISSION LINES.—The Clyde Navigation Trust at its meeting on November 1st, agreed to permit the Central Electricity Board to carry across the Clyde at Yoker 132,000-V transmission cables on condition that, when they are in position, no portion shall be less than 220 ft. above the high-water mark of ordinary spring tides.

United States.—ELECTRICAL DEVELOPMENTS.—According to *Power* a single-cylinder steam turbine is being manufactured for installation in the Charles R. Huntley station of the Buffalo General Electric Co. The new set will be rated at 75,000 kW, and will increase by nearly 50 per cent. the present station capacity of 155,000 kW. The constantly increasing demand for power in the vicinity of Niagara Falls and the fact that the present international agreement will not permit more water to be diverted from the falls for hydro-electric generating purposes, make it necessary for a continually larger amount of steam-generated power to be distributed in addition to the basic power from Niagara. The five existing sets are of 20,000, 35,000 and 60,000 kW capacity. The new machine will be rated at 83,333 kVA, 90 per cent. power factor, 1,500 r.p.m., 25 cycles. The turbine will be operated under standard station steam conditions of 250 lb. pressure, 250 deg. superheat, and 1 in. absolute back pressure.

Warrington.—STATION FLOODED.—The borough electrical engineer (Mr. F. V. L. Mathias) informs us that during the recent gale, the overflow from the River Mersey flooded the engine room, and put all the condensing plant out of action, with the exception of the set then running. The extraction pump motor of this set, a 3-phase induction motor, was actually running with the water above the shaft coupling. With the aid of the local fire brigade the water level was reduced. This plant was kept running throughout the week-end, and was taken off after the remainder of the plant had been dried out. When taken off load the motor tested out quite well, and appears none the worse for its unusual experience.

Warwickshire.—INSTITUTION SERVICES.—The County Council is seeking sanction to the following loans for works at the county mental hospital: £33,200 for heating, lighting and power services; £2,500 for battery and shop tools; £3,000 for refrigerator and automatic telephones.

Wimbledon.—LOAN SANCTIONED.—The Borough Council has received sanction to the borrowing of £43,409 for generating plant.

Tramway and Railway Notes.

Australia.—MELBOURNE.—We have received from the Melbourne and Metropolitan Tramways Board (engineer, Mr. T. P. Strickland; manager, Mr. A. D. Murdoch), a copy of the report together with the statement of accounts for the year ended June 30th last. The total revenue from the electric system amounted to £1,429,014, and after allowing for working expenses (£963,557) there was a gross profit of £465,457, which was carried to net revenue account together with a gross surplus of £310,197 from the cable system, and a gross deficit of £46,906 from the motor-omnibus service, making a total of £728,748 available. Capital charges absorbed £299,359, and there was a net surplus of £429,390. Of this £427,461 was appropriated for various purposes, and the balance of £1,928 carried forward. In the preceding year after meeting all charges and appropriations there was a deficit of £242,477. During the year the Board's expenditure upon the construction and reconstruction of tramways, conversion of cable tramways to electric traction, &c., amounted to £985,216. The number of passengers carried on the electric system increased from 99,017,938 to 118,858,967, and the car-miles run from 10,657,728 to 13,387,869. An additional 12 miles of single track was converted from cable to electrical working, and nearly one-third of the cable system had been converted at the end of the year under review at an approximate cost of £1,300,000. New track with a total length of nearly three route-miles was put into service, and over 20 miles of single track reconstructed.

Continental.—ITALY.—Two notable experiments will be completed next year. The State Railways will construct a d.c. system to serve the Benevento-Foggia railway, which it is proposed to extend to the new Rome-Naples direct line now operated by steam, and a 3-phase system on the Rome-Avozzano line. The following lines are being electrified: Bolzano-Brennero, Sampiedarena-Alessandria, and Avezzano-Sulmona, and they should all be completed by the end of 1929. The length of electrified track, completed or under construction, operated by the State is now 1,620 km. To this should be added the lines conceded by the State to private interests amounting to about 1,000 km. already electrified and 300 km. under electrification, the grand total thus being about 3,000 km.—*Reuter's Trade Service* (Milan).

POLAND.—The Société des Tramways Suburbains et Vicinaux de Varsovie has drawn up plans for the electrification of about 56 miles of tramways and local railways in the Warsaw district. The scheme is estimated to cost nearly a million sterling and to occupy about two years.

BELGIUM.—The Belgian State Railway Exploitation Co. is preparing plans for the electrification of the line between Brussels and Tervueren.

Kent-Surrey.—PROPOSED NEW ELECTRIC RAILWAY.—A report just issued by the North-East Surrey and West Kent Joint Advisory Town Planning Committee states that, owing to the absence of adequate cross-railway communication in the district between east and west, a scheme for a new electric railway, designated the Southern Heights Railway, 28 miles in length, is being considered. According to the *Electric Railway and Tramway Journal*, this line would commence near Purley Downs Road and proceed along the ridge of the chalk hills *via* Sanderstead, Warlingham, and Chelsham to Tatsfield. Thence it would cross Westerham Hill, Downe, and Farthing Street, to Farnborough, continuing to a junction with the Sevenoaks-Tonbridge line of the Southern Railway near Orpington.

Leyton.—TRAMWAY IMPROVEMENT.—The Electric Lighting and Tramways Committee has received sanction to the borrowing of £1,606 for the doubling of a portion of the tramway track in High Road, between Hainault Road and the Midland Railway station.

London.—"UNDERGROUND" IMPROVEMENTS.—The London Underground Electric Group has announced a programme for modernising the rolling stock and equipment of the entire system under its control at an estimated cost of £2,500,000. The work will occupy two years. According to *The Times*, Mr. Frank Pick, assistant managing director, states that the main idea of the overhaul is to bring all the rolling stock and equipment of the system up to the standard of efficiency represented by the new material which has been put into service on the latest extensions and the reconstructed lines. It is desired to carry greater loads and run at higher speeds all round. On the District Railway the strain imposed by modern traffic demands on rolling stock which has been in use for over 20 years is particularly heavy. Moreover, since the electrification of that railway in 1905-6 great improvements have been made in motor design. For the general renewal of the old stock new motors are being purchased, as well as new control equipment and new cars. The new cars on the tube railways will have pneumatically operated doors and improved lighting, seating, and ventilation arrangements. The District cars will retain the present hand-worked doors. All the new material will be made in Great Britain. The work will not be allowed to interfere in any way with the normal running of the railway services. Temporary works have been built for the purpose at Feltham, and the existing works at Acton have been enlarged. It is intended that the trains shall be taken out of service one at a time, and either altered in accordance with modern requirements or changed for new rolling-stock. The company states that the cost will be met entirely out of revenue and existing resources, and no new capital will be raised.

Northampton.—ABANDONMENT OF TRAMWAY.—*The Times* reports that the Town Council is to consider a scheme for scrapping a portion of the tramway track and substituting a service of six-wheeled omnibuses, each capable of carrying 50 passengers.

Telegraph and Telephone Notes.

Continental Telephony.—BRITAIN-SWEDEN SERVICE.—Telephone communication between Malmo (Southern Sweden) and London was opened on November 7th over a direct line by way of Berlin. Communication from Stockholm and Gothenburg with London is possible by the same route.—*Reuter* (Stockholm).

France.—AUTOMATIC TELEPHONY.—As a result of the development of the telephone industry in France the report of the Etablissements Industriels de Grammont states that the Company has been induced to form, with the co-operation of the Western Electric Company and the General Electric Company of London, a subsidiary company under the title of the Société des Telephones Grammont, with a share capital of 18,000,000 fr. This company has been entrusted by the French Postal Administration with the construction of a part of the automatic telephone system in Paris.

League of Nations.—RADIO COMMUNICATION.—In view of the need felt by the League of Nations for the possession of further communication facilities, it is announced that the Board of the Swiss Marconi Company has decided to install a new high-speed radio-telegraph transmitter with an anode power of 50 kilowatts. The range of the installation will be over 3,000 kilometres and the station will be capable, in normal weather, of linking-up the headquarters of the League at any moment with any spot in Europe, the Far East, and North Africa. The present transmitters will be reinforced, so that the League will by next summer have at its disposal four high-power transmitting sets, and it will be possible to receive simultaneously from twelve foreign stations. At the same time, the Swiss Marconi Company will have an office permanently open at Geneva from which it will be possible to transmit news directly by wireless telegraphy. The estimated cost of the scheme is 650,000 Swiss francs, which will raise the total expenditure on the Swiss Marconi Company's installations to over 3,000,000 Swiss francs.—*Reuter* (Berne).

Radio Notes.

Empire Broadcasting.—EXPERIMENTAL RECEPTION.—Mr. Beardsley, a radio amateur, picked up transmissions during the night of November 1st-2nd from the new British short-wave station at Chelmsford, 5SW, with which the British Broadcasting Corporation is carrying out experiments, which will serve as a guide to its future policy with regard to Empire broadcasting. Reception was very clear indeed.—*Reuter* (Durban).

Last week-end the English 24-metre station (5SW) conducted its first really extensive tests. It transmitted continuously for 36 hours, and was heard in Australia. Sydney reports that reception was at its best when it was the middle of the morning here and 9 p.m. or so in Australia. Strength is said to have been R7 and R8 (R9 is the maximum in this code scale). When it was evening here 5SW was inaudible in Australia, and could not be picked up between about 6.30 p.m. and 4 a.m. Greenwich time.

Reception in New Zealand at Wellington was heard from 11.50 p.m. on Saturday until 2.30 a.m. on Sunday. Until 1 a.m. reception was only on headphones, but afterwards there was fair loud-speaker strength. The broadcast was also clearly heard at Auckland from 4 p.m. (summer time) onwards on Sunday. The gramophone music, organ solo, and announcer's statement regarding the experiments were picked up on 3-valve sets, and came through with remarkable clarity on the loud-speaker, though there was frequently slight fading.—*Reuter* (Wellington).

Holland.—IMPORTS INCREASE.—At the annual meeting of the Netherlands Union for Radio Dealers it was stated that in 1923 the total value of wireless sets of all kinds imported into Holland was 250,000 guilders, or about £20,000, says *World Radio*. The increase in the last few years has been so great that in the first nine months of 1927 the value of the imports was just over six million guilders (£500,000).

PCJJ's REMOVAL.—Owing to unforeseen circumstances the transference of the Eindhoven short-wave transmitter (PCJJ) to Hilversum has been delayed and will probably not take place before the middle of November.

Poland.—RADIO CONFERENCE.—There has recently been held at Warsaw a broadcasting conference, with the main object of studying the problem of exchange by landline of the broadcast programmes between the Central European countries, *i.e.*, Poland, Germany, Austria, and Czechoslovakia. The Conference, which took place in the offices of the Ministry of Posts and lasted three days, says *World Radio*, was attended by the duly authorised delegates of the respective countries.

WAVELENGTH CHANGE.—The Cracow station's wavelength of 422 metres, it is understood, will be allotted to the new station in Katowitze, and since October 25th it has worked on 500 metres. Katowitze, being a station of 10 kW, had to adopt an exclusive wavelength, while the former could do with a common wave.

United States.—ANOTHER BROADCASTING CHAIN.—The Chicago Federation of Labour, which has been experimenting with station WCFL for the past two years, plans a chain of co-operative farmer-labour owned and operated broadcasting stations, says *World Radio*. A representative of WCFL is asking State federations of labour to assess themselves $1 a year per member so that entrance may be made to the radio field on an extensive scale. WCFL is now about to expand and unite with the Iowa Farmers' Union in the erection of a station near Elgin, Ill. The WCFL plant in Chicago cost £40,000, and is now, after a laborious fight, established.

A NEW MICROPHONE.—Mr. S. W. Goulden, of the Radio Corporation of America, states that a new type of microphone has been tested by WJZ in New York, WGY in Schenectady, and KDKA in Pittsburgh, and proved successful. It is a condenser microphone and is reported to reduce the effect of extraneous noises caused by mechanical vibration at the point where the programme originates.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—January 17th. National Sanitation Works Department. Three 350-kW Pelton-type turbines and 6,600-V, three-phase generators. Two 20-kVA 3-phase static transformers, one distribution switchboard and connections, &c. (B.X. 3921.)*

Australia.—SYDNEY.—December 7th. N.S.W. Government Railways. Three 5-ton and one 25-ton electric travelling cranes.

MELBOURNE.—January 3rd. Postmaster-General's Department. Switchboard lamps, lamp caps, and lamp sockets. (B.X. 3943.)*

December 13th. Submarine cable. (B.X. 3963.)*

Ayr.—November 29th. Tramways Committee. Stores for 12 months, commencing January 1st, 1928, including overhead line material, &c. Forms of tender from the Manager.

Bingley.—November 18th. West Riding County Council. Public Health and Housing Committee. Electric lighting installation, Eldwick Sanatorium. Specifications, &c., from West Riding architect, County Hall, Wakefield.

Blackpool.—December 15th. Electricity Committee. One 1,750-kW motor-convertor for traction supply. (See this issue.)

Bradford. — November 12th. Tramways Committee. Stores, including electrical fittings for tramcars, insulating material, &c., for 12 months. Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

Dewsbury.—December 12th. Corporation. Pumps, motors, and other electrical plant for the Ravensthorpe sewage works. Specification (£2 2s.) from the borough engineer, Mr. H. Dearden.

Dinas Powis.—November 16th. St. Andrew's Parish Council. Wiring the Parish Hall for electricity. Specifications from Mr. T. W. Davies, clerk to the Council, Council Office, Dinas Powis.

Dundee.—November 18th. Electricity Department. 2-3- and 4-core, paper-insulated, lead-covered and double-steel tape-armoured cable. (See this issue.)

Dunfermline.—November 16th. Carnegie Dunfermline Trust. Electric lighting work in connection with the additions and alterations to Bandrum House. Specifications from Mr. C. R. Douglas, 15, East Port Street, Dunfermline.

Edinburgh.—November 19th. Tramways Department. 25 air brakes suitable for electric tramcars. Specifications from Tramway Manager.

Egypt.—CAIRO.—November 26th. Ministry of the Interior. One 128-kW Diesel engine-driven electrical installation for the town of Simbellawem. (B.X. 3885.)*

Great Yarmouth.—November 19th. Electricity Department. 30,000 yd. 33,000-V 3-core cable, 15,000 yd. pilot and telephone cable, and 7,040 yd. 11,000-V, 3-core cable. (October 28th.)

Hastings.—December 5th. Electricity Department. One turbo-alternator and one water-tube boiler. (November 4th.)

Hawarden.—November 23rd. Electricity Department. Transformers for sub-station. (See this issue.)

Hull.—December 7th. Electricity Committee. Boiler house steel structure, h.p. water-tube boilers, coal- and ash-handling plant. (November 4th.)

India.—November 18th. India Store Department. 26,600 inert cells. (November 4th.)

November 25th. Bombay, Baroda, and Central India Railway Co. Electric jib cranes, &c. Specification (20s.) from Mr. S. G. S. Young, secretary, White Mansion, 91, Petty France, Westminster, S.W.1.

London.—November 22nd. North British Aluminium Co., Ltd. Water turbines, alternators and exciters for the Lochaber water power scheme. (October 28th.)

SOUTHWARK.—November 24th. Board of Guardians. Complete wireless installation for the Southwark Hospital, East Dulwich Grove. (October 28th.)

H.M. COMMISSIONERS OF WORKS.—November 14th. Supply of (1) Electrical, (2) mechanical engineering labour-in-day-work in connection with the maintenance, &c., of installations in the Glasgow district during the period of three years from January 1st, 1928. Forms from Contracts Branch, H.M. Office of Works, London, S.W.1.

CENTRAL ELECTRICITY BOARD. December 22nd. 132,000-V transformers for the Central Scotland Electricity Scheme, 1927. (See this issue.)

Manchester.—November 28th. Electricity Committee. H.p. steam and feed-water pipework. (November 4th.)

November 21st. Safety cartridge fuse fittings for 12 months. (See this issue.)

December 13th. Tramways Committee. Magnetic track brakes for tramcars. Specifications from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

New Zealand.—WELLINGTON.—December 13th. Public Works Department. Three 10-ton overhead travelling double-girder cranes. (A.X. 5378.)*

December 13th. 50-V lightning arrestors for the Arapuni power scheme. (B.X. 3919.)*

January 10th, 1928. Additional 110,000-V switchgear, steelwork and control board for Arapuni electric power supply. (B.X. 3837.)*

January 17th. 110,000-V switchgear, protective apparatus, steelwork, storage batteries, &c., for the Waikaremoana power scheme. (B.X. 3858.)*

January 17th. 50-kV switchgear and steelwork for Arapuni. (B.X. 3917.)* 11,000-V switchgear and metering equipment for Arapuni (Sec. 254). (B.X. 3920.)*

January 24th. 11,000-V switchgear and metering equipment for Arapuni (Sec. 261). (B.X. 3918.)*

Porthcawl (Glam.).—December 5th. Electricity undertaking. Switchgear, transformers, overhead and underground mains. (See this issue.)

Pontefract.—November 26th. Installation of electric lighting at public baths and destructor. Specifications from Mr. W. H. Newton, borough engineer, Municipal Offices, Pontefract.

Rochford.—November 12th. Board of Guardians. Additions to the electrical storage battery at the Institution. (November 4th.)

South Africa.—TULBAGH.—December 12th. Municipal Council. Erection of power station and distribution network. (B.X. 3911.)*

JOHANNESBURG.—November 17th. Municipal Council. Supply of h.p. cable. (B.X. 3931.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—MELBOURNE.—State Electricity Commission of Victoria. Accepted :—
6 miles 3-core h.p. cable.—Johnson & Phillips, Ltd.

Barnstaple.—Town Council. Accepted:—
Installing electric lighting at the Castle.—F. Bickford.

Darwen.—Town Council. Accepted:—
Switchgear for turbo-generator, bulk supply transformer, and the e.h.p. feeder for Hoddlesden section.—Metropolitan-Vickers Electrical Co., Ltd.

Dewsbury.—Town Council. Accepted:—
Cables.—Power & Lighting, Ltd.

Egypt.—CAIRO.—Egyptian State Railways. Accepted :—
Telephone cable (£1,300).—Johnson & Phillips, Ltd.

Hastings.—Watch Committee. Recommended:—
Rewiring central police station.—Webber & Hudgell.

Lamp Contract.—The British Thomson-Houston Co., Ltd., has received a contract for a 12-months supply of electric lamps from the Great Western Railway.

Lichfield.—Board of Guardians. Accepted:—
Installing electric lighting at the Infirmary (£229).—Lichfield Agricultural Co.

London.—STEPNEY.—Electricity Supply Committee.
½ ton plumber's solder and 5 cwt. tinman's solder (£75); 3 tons plumber's solder (£271).—H. B. Barnard and Sons. ¼ ton tinman's solder (£60).—E. Austin and Sons (London), Ltd.
50 tons pitch (£244).—Crow, Catchpole & Co., Ltd. (Recommended.)
2 tons sheet lead (£57).—Neal's Supply Co. (Accepted.)
50 disconnecting boxes (£103).—Lucy & Co., Ltd. (Accepted.)
500 current limiters (£400).—Electrical Utilities, Ltd.
One wattmeter and two current transformers (£61).—Elliott Bros. (London), Ltd. (Recommended.)

Manchester.—Electricity Committee. Accepted:—
Small electric cookers.—Credenda Conduits Co., Ltd.

New Zealand.—WELLINGTON.—Postmaster-General's Department. Accepted :—
3 miles 600-pair telephone cable.—Johnson & Phillips, Ltd.

Rotherham.—Electricity Committee. Recommended:—
E.h.p. cable (£2,358).—Callender's Cable & Construction Co., Ltd.

Torquay.—Town Council. Accepted:—
250-kW rectifier for the Newton Abbot power station (£2,300).—Hewittic Electric Co., Ltd.

Forthcoming Events.

Physical Society.—Friday, November 11th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Junior Institution of Engineers.—Friday, November 11th. 39, Victoria Street, S.W. 7.30 p.m. Annual general meeting.
Friday, November 18th. Caxton Hall, Westminster, S.W. 7.30 p.m. Presentation of medals and awards by Engineer Vice-Admiral Sir Robert B. Dixon and inaugural address by the President, Sir M. MacDonald.

Illumination Design Course.—Monday, November 14th. Lighting Service Bureau, 15, Savoy Street, W.C. 7.30 p.m. "The Possibilities of Colour Lighting."

Nottingham Society of Engineers.—Monday, November 14th. "Electrical Heating for Industrial Purposes." Mr. F. S. Grogan.

Royal Society of Arts.—Monday, November 14th. John Street, Adelphi, W.C. 8 p.m. Cantor Lecture. "Alloy Steels, their Manufacture, Properties and Uses." Prof. H. C. H. Carpenter, F.R.S.

Public Works, Roads and Transport Exhibition (1927).—Royal Agricultural Hall, London, N. November 14th to 19th.

Association of Mining Electrical Engineers (London Branch).—Tuesday, November 15th. Junior Institution of Engineers, 39, Victoria Street, S.W. 6.30 p.m. Presidential address by Mr. H. H. Morgans.
(Western Branch).—Saturday, November 19th. 62, Wind Street, Swansea. "Systematic Maintenance of Colliery Plant." Mr. R. G. Jones.

Royal Institution of Great Britain.—Tuesday, November 15th. Albemarle Street, W. 5.15 p.m. "Light and Sight." Sir J. H. Parsons.

Paisley Association of Electrical Engineers.—Tuesday, November 15th. George A. Clark. Town Hall. 7.30 p.m. "Via Ether." Mr. J. M. A. Cameron.

Association of Supervising Electrical Engineers.—Wednesday, November 16th. Magnet House, Kingsway, W.C. Industrial heating and commercial cooking.

Institution of Engineering Inspection.—Wednesday, November 16th. Reception, presidential address, dance and concert.

Electrical Association for Women.—Wednesday, November 16th. Lighting Service Bureau, 15, Savoy Street, W.C. 7 p.m. "The Care and Maintenance of Electrical Apparatus." Miss G. Sharp.

Society of Technical Engineers (London Central Branch).—Wednesday, November 16th. 102, Belgrave Road, London, S.W.1. 7.30 p.m. Ordinary meeting.

Röntgen Society and British Institute of Radiology, 1927.—Thursday and Friday, November 17th and 18th, at the Central Hall, Westminster. Inaugural meeting.

Commercial Motor Show.—Olympia, W. November 17th to 26th.

British Electrical and Allied Manufacturers' Association.—Thursday, November 17th. Connaught Rooms, London, W.C.2. Annual dinner.

Institution of Electrical Engineers.—Thursday, November 17th. London, W.C. 6 p.m. "Apparatus Standards of Telephonic Transmission, and the Technique of Testing Microphones and Receivers." Mr. B. S. Cohen.
(North-Eastern Centre).—Monday, November 14th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "Higher Steam Pressures and their Application to the Steam Turbine." Messrs. A. H. Law and J. P. Chittenden.
(North-Midland Centre).—Tuesday, November 15th. Hotel Metropole, Leeds. 7.15 p.m. Informal discussion.
(North-Western Centre).—Tuesday, November 15th. Engineers' Club, Manchester. "The Applications of Electricity in Warships." Mr. W. McClelland.
(Western Centre). — Monday, November 14th. Bristol. 6 p.m. "Electrical Equipment on the Underground Railways of London." Mr. A. R. Cooper.
(London Students' Section).—Tuesday, November 15th. Australia House, Strand, W.C. 7.30 p.m. to 12 p.m. Carnival dance.
(East-Midland Sub-Centre).—Tuesday, November 15th. The College, Loughborough. 6.45 p.m. "Protective Gear." Mr. W. Wilson.
(Sheffield Sub-Centre). — Wednesday, November 16th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "Higher Steam Pressures and their Application to the Steam Turbine." Messrs. A. H. Law and J. P. Chittenden.

North-East Coast Institution of Engineers and Shipbuilders. Thursday, November 17th. The Mining Institute, Newcastle-on-Tyne. 6 p.m. "The Application of High Pressures to the Reciprocating Steam Engine." Mr. S. G. Visker.

Chemical Engineering Group.—Friday, November 18th. Burlington House, W. 8 p.m. "Some Modern Methods of Recovery of Lubricating Oils." Mr. A. J. Broughall.

British Electrical Development Association. — Friday, November 18th. Royal Society of Arts, London, W.C. 7.30 p.m. "Assisted Wiring, Hire, and Hire Purchase Schemes: Recent Progress." Mr. S. E. Fedden.

Midland Electrical Engineers' Ball.—Friday, November 18th. Grand Hotel, Birmingham.

Electrical Power Engineers' Association (Kent Section).—Saturday, November 19th. Old Palace, Maidstone. 5.30 for 6 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

Billiard-table lighting fitting containing only one lamp instead of six.

The Great Electrical Hare Competition.

The following dogs are left in the contest after running in the third heat :—Osram, 5; Miss Magnet, 7; Monach, 10; Cosmos, 15; Cable, 28; Centralisation, 30; E.T.B.I., 44; and Tricky Tricity, 48. In order to be in the final running, those whose hares were not caught in the third heat are invited to present hares to the running dogs in the next heat.

Notes.

E.A.W. Activities.

On November 2nd a very interesting lecture was given at the E.L.M.A. Lighting Service Bureau, London, by Mr. E. E. Sharp, of Messrs. Venner Time Switches, Ltd. The chair was taken by Lady Snell. After describing very simply the mechanism of a time switch, Mr. Sharp entertained his audience by illustrating the many uses to which time switches can be put. In the evening of the same day a lecture was given, in the absence of Mr. Bush, by Mr. Catten. The recently constructed model revolving house was shown to the members, and several interesting lighting demonstrations took place. Between 50 and 60 members of the South Wales and Monmouthshire branch of the Association spent an interesting afternoon on November 3rd visiting the C.W.S. biscuit factory at Cardiff.

The Empire Mining and Metallurgical Congress.

The Congress, which was an unqualified success, held its closing session in Quebec at the end of September, when votes of thanks to official and private hosts were enthusiastically adopted. At a meeting of the Empire Council of Mining and Metallurgical Institutions, held on the same day, it was unanimously decided that a dinner should be held in London to afford an opportunity of acknowledging the indebtedness of the constituent institutions to the Canadian Government and people. The dinner will take place on Tuesday, November 22nd, at the Hotel Victoria, Northumberland Avenue, London, at 7.15 for 7.45 o'clock p.m., to meet the Hon. Peter C. Larkin, High Commissioner for the Dominion of Canada, the Rt. Hon. Sir Robert S. Horne, K.C., M.P., Honorary President of the Congress, and other distinguished guests. A cordial invitation to assemble in South Africa in 1930, conveyed to the Congress by the Hon. F. W. Beyers, Minister of Mines and Industries, on behalf of the Prime Minister and Government of the Union of South Africa, was received with enthusiasm by the Congress and was duly accepted by the Empire Council.

Meter Engineers' Technical Association.

At the eighth general meeting of the above Association, held October 28th, Mr. E. W. Hill, A.M.I.E.E., delivered a lecture on "Friction in Meters," the substance of which is contained in a paper under this title which appeared in No. 6 of the *Proceedings* of the Association. He dealt in detail with the various frictional retarding torques developed in electricity meters, and described experiments which had been carried out with a view to arriving at definite conclusions regarding their effects upon the accuracy of meters. Mr. C. H. W. Gerhardi, in opening the discussion, took exception to the suggestion that lubrication of the jewel has no useful effect, and submitted details of tests carried out by him which proved, he contended, that the judicious use of carefully selected oil materially assisted in the maintenance of accuracy at low loads. Mr. G. D. Malcolm considered that the value of the paper was enhanced by the fact that the experiments described were of so scientific a nature, and called for the use of such elaborate and costly apparatus that they were necessarily beyond the scope of the average meter engineer. Major E. A. Pells said he had found that a medium-weight rotor gave the best all-round results. An extremely light rotor tended to "chatter," which resulted in greater damage to the jewel than years of normal service. Mr. A. J. Pitt contended that the diamond was vastly superior to any other jewel and, despite its high initial cost, was to be recommended for large meters where the cost of the jewel was relatively of no importance compared with the value of the energy to be metered. Mr. L. J. Matthews suggested that the paper might be the means of setting up a standard for jewels.

Diesel-Electric Ships.

Judging from recent advices, the *Motor Ship* states, the United States Shipping Board intends to proceed with the conversion of three of its larger cargo vessels, the *Courageous*, *Triumph*, and *Defiance*, to motor power by the adoption of the Diesel-electric drive. The statement has been made that by this means the cost of the conversions will be lower than has been the case of previous steamers transformed into motor vessels by the installation of slow-running Diesel engines direct-coupled to the propeller.

It is evident that the Board intends to proceed with its work of conversion with the funds in hand, and as these amount to several million pounds there is, presumably, no obstacle to at least another 20 ships being converted to motor drive. Orders for eight have already been placed, in addition to the three mentioned above, and there is a likelihood of several further projects being carried out in the near future. If it is urged that this wholesale conversion is not such an efficient method of building up a satisfactory mercantile fleet as building new motor vessels, it must be remembered that the Board has no power to construct ships, but only to replace steam machinery by oil engines.

The Atlantic Refining Co. has ordered three Diesel-electric tankers similar to that now building at Scott's yard.

E.P.E.A. Dinner.

The fifth annual dinner of the West Yorkshire Section of the Electrical Power Engineers' Association was held on November 5th at Leeds, Mr. R. H. Toynbee, chairman, presiding. In proposing "The Association," the Lord Mayor of Leeds, Alderman Hugh Lupton, J.P., paid a tribute to the Association on the score of its past work. It was in its desire to prevent such a deadlock as that of last year that the Association found favour. Another great object of the Association was to promote amongst its members a real knowledge of the subject with which they had to deal. He deprecated any undue optimism as to immediate results from the new electricity schemes.

Responding, Mr. A. W. Compton, President of the Association, said that the employers had proved themselves to be real partners in seeking to improve the status of the industry, and the work which had been done was already having good results. If true co-operation between employers and employed could only be brought about generally to the same extent as that which operated in the electrical industry, progress and peace would inevitably result. Referring to the Association's new training scheme, Mr. Compton said that the body was also endeavouring to improve the qualifications of the men at present in the industry.

In proposing "The National and District Joint Boards," Mr. R. R. Telford, Sheffield, said that, going back to the days of the national strike, the N.J.B. declared that it would have no interference with electricity supply, and throughout the trouble the supply was kept up, with the result that the strength of the Board was considerably increased.

In reply, Alderman J. Longley, vice-chairman of the Bradford Electricity Committee and chairman of the No. 2 Area Board, said that the employers felt proud that the old line of demarcation between employer and employed had been wiped out. It was always a pleasure to meet the representatives of the Association, and the work which they did was greatly appreciated. The No. 2 Area was one of the districts which had not yet fully accepted the training scheme, not because it was not prepared to accept a training scheme, but in any scheme brought forward they had to bear in mind that what might be applicable in the South of England was not necessarily the best for the North of England or Scotland. Under the scheme the newcomers into the industry were to be fully protected, but they had failed to find similar protection for those already in it. A well-tried official of many years' standing should be placed in at least an equal position with regard to any application he might make for any office of higher standing as a member who had only been on the register for 10 years. With regard to the clause stating that training should be given in stations of a certain size and over, he felt that the biggest shop was not always the best for training. Whilst one did not wish to see wages reduced in any way, it might be well for the Board seriously to consider the question whether reductions could be made in distribution expenses. The speaker suggested that it might be a good move to encourage members of the various Associations to take degrees, and to see that where success was achieved it should be acknowledged.

The chairman took the opportunity of making presentations to Mr. N. McLean, Harrogate, Mr. J. Best, Leeds, and Mr. A. J. S. Waddell, Bradford, to mark the appreciation of the members of the West Yorkshire section for the manner in which those gentlemen had carried out their various official duties in the past.

Mr. A. C. Ivimy, Leeds, proposed "The Ladies and Guests," to which Lt.-Col. W. A. Vignoles, D.S.O., Grimsby, replied. The latter said that the Association was a very important one, as to it they had to look for the chief engineers of the future. He suggested the E.P.E.A. should show a lively interest in the work of the Electrical Development Association.

Mr. J. A. Bromley, of York, proposed "The Chairman," to which Mr. Toynbee suitably responded.

Electric Power Cables.

In a paper read before the Institution of Engineering Inspection, Inc., on October 14th, on "Electric Power Cables and Recent Developments," by Mr. C. M. Read, the construction, uses and tests of the various types of cable at present generally in use are outlined. The cables are dealt with under four headings according to the classes of insulation: paper, rubber, vulcanised bitumen and cambric. Attention is given to the jointing of super-pressure cables, with some comments on the common failure of cables for the higher pressures. The general constructions of the "H," triple-lead-sheath, and the hollow-core types of cables are outlined.

In the subsequent discussion on the paper, Mr. R. D. Dale gave some interesting figures obtained from recent comparative tests on tough rubber compounds and some of the special compounds which Mr. Read had referred to as "ites." At a temperature of 270 deg. F. one of the newer "ites" broke down after 5¼ hours; one of the better known "ites" broke down after 8¼ hours, and the tough rubber compound after 10 hours. In an abrasion test the "ites" lost 7.85 per cent. in weight, whilst the tough rubber compound lost only 1.05 per cent. In acid tests the "ites" lost 0.288 per cent., and the tough rubber compound 0.21. In an alkali test the "ites" lost 0.394 per cent., and the tough rubber compounds 0.13. In the oil-absorption tests the "ites" absorbed 8.4 per cent., and the tough rubber compound 7.47 per cent.

Higher Boiler Operating Pressures.

A contract has just been placed for the Kansas City Power and Light Co., Kansas City, Mo., covering the manufacture and supply of two 1,695-h.p. boilers, to operate at a working pressure of 1,400 lb. per sq. in. With the boilers there will be included primary superheaters to give a total steam temperature of 725 deg. F. Radiant reheaters will be installed in the combustion chambers to reheat the steam to 725 deg. F. after it has passed through a 10,000-kW turbo-generator. Steam will be exhausted from this turbine into the radiant reheaters at 300 lb. pressure and will afterwards be used for operating the existing low-pressure turbines. The boilers are to be built by the Heine Boiler Co., Ltd., a subsidiary of International Combustion Co., and their drums are to be forged from solid steel and fin tube economisers will be installed with each unit, together with the plate type air heater. The furnace will embody "Lopulco" fin tubes, water screen, and forced-draught burners. The normal evaporation of each will be 170,000 lb. per hr. with a maximum rating of 250,000 lb. A similar contract has also been secured from the Solvay Process Co. for plant at the Grand Avenue station; three 15,160 sq. ft. 3-drum boilers to operate at 700 lb. pressure have been ordered, the maximum capacity of each to be 225,000 lb.

Röntgen Society and British Institute of Radiology.

For a number of years the interests of those persons in this country concerned with the science and practice of radiology have been represented by both the Röntgen Society and the British Institute of Radiology, but it was felt that the arrangement was by no means ideal, and that the most desirable plan would be the constitution of a new Institute, which should be representative of all branches of radiological science. It was decided definitely at the end of last session that the two bodies should be merged into one, and this fusion has now actually taken place. The 1927-28 session of the new joint body which will be known as "The Röntgen Society and British Institute of Radiology," will be held on November 17th and 18th next at the Central Hall, Westminster. The president-elect is Sir Humphry Rolleston, K.C.B. The programme for the meeting includes the presidential address and, on the second day, addresses by various high authorities, including Sir James Purves-Stewart, Sir John Thomson-Walker, Dr. G. W. C. Kaye, Professor Sidney Russ and others, on physical and medical subjects connected with the use of X-rays. These are to be followed by a dinner at the Wharncliffe Rooms, at 7.30 p.m. A further important feature of the meeting will be an exhibition of apparatus, which is to be held throughout the two days at the Central Hall. Although the exhibition is not confined to British manufacturers, it is pleasing to see that these predominate and are without doubt in the forefront of the industry.

Million-volt Testing Plant.

The Allgemeine Electricitäts Gesellschaft, of Berlin, has recently established plant at its works at Oberschonweide for testing transformers up to a pressure of one million volts to earth with 50-period a.c.

The Batti-Wallahs.

On Wednesday, November 2nd, the Batti-Wallahs' Society entertained Mr. Archibald Page, president I.E.E. and chief engineer to the Central Electricity Board, at luncheon at the Hotel Cecil; there was a large attendance of members, and the president, Mr. G. W. Partridge, M.I.E.E., occupied the chair, and proposed the health of the principal guest, which was accorded musical honours. Mr. Partridge remarked that Mr. Page had only one enemy—the artist who caricatured him in one of the technical journals [not the ELECTRICAL REVIEW—EDS.].

Responding, Mr. Page, in the course of a short address, remarked that he was in close touch, by personal interviews, with the managers of the authorised undertakings in South-Eastern England. Unfortunately, he said, as each scheme was published there came a renewal of the misleading forecasts that were prevalent when the Bill of 1926 was going through Parliament; the public was led to believe that electricity would be available for all purposes at 1d. a unit or less. All such loose talk was very much to be deplored; the industry had to explain that that was a myth, and the Board would probably suffer when the inevitable reaction took place. It could not be too strongly insisted that what had been happening had to do solely with the *production* of electricity; he believed in its efficacy, but they could not alter the fundamental principles which determined the selling price to household consumers; the economies that might be affected would only bear indirectly on that price, which was governed by other factors to a much greater extent. If they succeeded in levelling-up the whole country to the standard of efficiency in generation that was reached in some areas, they would have earned thanks; they could not cheapen much where the results were already good. In many places they had to-day a cheap and abundant supply of electricity; the "grid" would increase the availability of bulk supply and encourage its extension into new territory—probably the greatest advantage of the new policy. The apportionment of load between the selected stations would be done after close investigation, and consultation with the supply industry; far too much had been spent on generating plant, and until that capital was amortised, they would have a thin time. The margin on cost of production would for a time be very small, but the Act provided a Government guarantee—the last resort. He was a firm believer in the "grid"; when electricity supply engineers were free to devote their whole attention to the development and sales side of the business great progress would be made—what had been done in the past was nothing to what would be done in the future, and their plans should be laid with that fact in view. The "grid price" had to be worked out in accordance with a special schedule, and might prove to be quite favourable. The industry was going to have a "square deal"; he looked to it for real team work and complete co-operation—if all played the game success was certain. A recent statement in the lay Press that the chief engineers of London municipal undertakings were antagonistic to the scheme was a libel; these men were completely loyal to the cause, and he indignantly flung back the allegation.

Mr. A. W. Blake, immediate past-president, moved a vote of thanks for the address, and assured Mr. Page of the support of the London engineers.

A "Safety-First" Poster.

The accompanying illustration is of a poster published by the Accident Prevention Department of the National Employers' Mutual General Insurance Association, Ltd., and issued jointly by the Association of Supervising Electrical

Make sure the current is off.
To be sure put the fuses in your pocket.
Holders should NOT be used for hand lamps
FAMILIARITY BREEDS CONTEMPT!
On
Issued jointly by The Association of Supervising Electrical Engineers
Don't use Electric Drills from Pendants. Use three core flex off wall plug. Earthing essential.

A "Safety-First" Poster.

Engineers. The value of such posters has from time to time been evidenced by statistics showing considerable reductions in the numbers of accidents after the display of such posters in various engineering works, and so on.

Appointments Vacant.

One fitter (£400) and one cable jointer (£410) for the Government of Sierra Leone. Telephone engineer (£E720) for the Egyptian State Railways. Diesel engine fitter (£380) for the Gold Coast Government Railway. Stores clerk (£180) for the Borough of Eccles Electricity Department. Junior mains assistant for the County Borough of Walsall Electricity Department. Engineer and manager (£500) for the Spalding U.D.C. Gas, Water and Electricity Departments. Meter tester for the Borough of Preston Electricity Department. (See our advertisement pages to-day.)

Electricity Associations in the Irish Free State.

At a largely-attended meeting held in Dublin recently under the chairmanship of Mr. T. J. Hamilton, M.I.H., V.E., it was decided to form an Association for the specific purpose of encouraging the extended use and development of electricity for light and power. This step was the outcome of a suggestion made by Mr. L. J. Kettle, Dublin City electrical engineer, at a luncheon given recently by the Electricity Association of Ireland. A further suggestion of Mr. Kettle, that a women's association should be formed, has also taken definite shape, and at a women's meeting held in the boardroom of the Dublin Corporation Electricity Department, it was decided to form a Dublin Women's Electrical Development Association for the specific purpose of fostering the use of electricity in matters connected with the home and domestic life. The Women's Association is to be entirely independent, and will devote attention to the popularising of electricity in Dublin and its suburbs.

American Supply Standards.

The National Electrical Manufacturers' Association of America has recently issued a new edition (October, 1927) of the Nema Handbook of Supply Standards, a guide book on the design, manufacture, and installation of electrical supply equipment. This completely revised 230-page edition, which is indexed and illustrated, contains standards endorsed by 189 manufacturers of air circuit breakers, attachment plugs, fuses, cut-out bases, switches, lamp receptacles, non-metallic flexible conduit, overhead trolley-line materials, distribution boards, signalling apparatus, and so on. The standards have been approved by the Standards Committee, the official body for the control of technical standardisation within the Association. Copies of the handbook may be obtained from the National Electrical Manufacturers' Association, 420, Lexington Avenue, New York City.

Artificial Sunlight and Ultra-Violet Radiation.

A new series of lectures on "Artificial Sunlight and Ultra-Violet Radiation" will be commenced on December 7th, at 7.30 p.m., at 50, Wigmore Street, London, by Mr. J. W. Mason, F.B.O.A., F.I.O. The course will consist of six lectures, and arrangements have been made to allow members of the trade who are anxious to understand the nature of the radiation, and so on, to attend them. The fee for the course is £3 3s.

Development Commissioners' Report.

In the Report of the Development Commissioners for the year ended March 31st last, reference is made to the electro-culture work carried out at the Research Institute of Plant Physiology, Imperial College of Science and Technology. The work has been continued by means of pot-culture work on a large scale, nearly 700 pots being employed. The influence of the discharge on the "reproduction coefficient" (the ratio of grain yield to total yield of grain plus straw) has again been confirmed, and furthermore an interesting and important relationship to phosphate manuring has been shown to exist. With the low phosphate manuring of 1925 the effect of the electrical discharge was to lower the proportion of sterile flowers, while in 1926, with a higher phosphate manuring, the action has been in the other direction. The laboratory work has been continued and has shown the very marked effect of ionised air on the physiological processes of the plant.

The Harpenden station for windmill research has now been dismantled, and the instruments and fittings transferred to Oxford. It is felt, however, that time should be allowed for design to make further advances before proceeding with another series of observations. Other electrical work has included a study of rural electrification, and a practical investigation is being put in hand. The question of utilisation of small water-power has also received attention.

Dublin Women's Electrical Association.

A meeting of ladies in Dublin recently decided on the formation of a Women's Electrical Development Association, the object of which is to secure the co-operation of all the women of the city in securing the extension of the domestic uses of electricity. Mr. Gilbert Archer, who attended on behalf of the City Administrative Commissioners, pointed out that the Association was not being formed by the Electricity Department, but they would give what help and encouragement they could. Mrs. Hugh Kennedy, wife of the Chief Justice of the Irish Free State, was elected as the first president of the Association.

Firemen's Protection.

The necessity of some form of protection being adopted for firemen when attending fires at premises wherein electric cables are laid, is being urged by the Birmingham Watch Committee. Particularly it is stated that protection is necessary where high-voltage energy is supplied, and the danger of contact being made through water is pointed out. The matter has engaged the attention of the authority for some considerable time, and recently the advisability of having an easily visible plate indicating the presence of high pressure in a conspicuous position on premises was emphasised. The Watch Committee suggests that some arrangement should be made whereby the electrical energy could be switched off at or near the entrance to the premises. It is appreciated that, so far as existing installations are concerned, some difficulty may be experienced in meeting the situation, but a conference has been arranged between members of the Watch Committee and representatives of the Electricity Supply Department to ascertain if some such arrangement can be adopted in the city.

The Frequency Change-over.

In connection with a paragraph which appeared in our last issue to the effect that the first contract towards the unification of the electricity supply frequency in connection with the Central Scotland scheme had been placed by Glasgow Corporation Electricity Department, it is stated that this is an erroneous interpretation of a situation which arose at Dalmarnock in connection with one of the sets. By arrangement with the manufacturers, this set was replaced by a larger set, which has been worked into the scheme. While the frequency of the larger set corresponds to the standard in the scheme, its installation has no direct connection with the scheme, as it would have been introduced in any event.

Fatality.

According to *The Times*, John Angwin (16), of Cowbridge Road, Cardiff, was killed by an electric shock on November 3rd. In trying to find the cause of an electric light failure at a house, he grasped a cable running along the garden wall and received a shock of 200 V.

Remembrance Day—November 11th.

Field-Marshal Earl Haig, issuing an appeal on behalf of the British Legion, writes:—

"On this day, nine years ago, the Armistice brought to an end four long years of the most devastating warfare our country ever experienced, during which more than a million of our men gave their lives in the cause of justice.

"Even nine years after the war there are thousands upon thousands of ex-Service men without work; there are countless widows and orphans with the scantiest means of livelihood; there are the disabled and tuberculous men requiring special help. All of these come within the scope of the benevolent activities of the British Legion, and if our voluntary relief committees are to continue or, as I sincerely hope, extend their work, sufficient funds are a vital necessity. I earnestly beg that not only will everyone wear a Poppy in remembrance of those who gave all, but, as an act of practical service to those who are still with us, pay as generously for it as their means will allow.

"Special donations should be addressed to Capt. W. G. Willcox, M.B.E., organising secretary, British Legion Appeal Fund, 26, Eccleston Square, London, S.W.1."

Greyhound Track Lighting.

The illustrations of the greyhound racing track at Carntyne, Glasgow, shown under the above heading in our last issue, were reproduced by kind permission of the *Sunday Mail* and *Daily Record*.

London Traffic Co-ordination.

At its meeting on Tuesday last the London County Council adopted the following resolution drawn up by the Special Committee on Traffic:—"That the Council is of opinion that it would be in the interests of the travelling public of London if an equitable scheme embodying the principles of common management and a common fund could be agreed upon by all authorities and bodies concerned in conveying London passenger traffic and carried into effect, provided that the Council shall not be committed, without further consideration, to the principles or details of the scheme prepared by the London and Home Counties Traffic Advisory Committee."

The draft scheme prepared by the Traffic Advisory Committee was outlined in our last issue (p. 782).

The British Association.

It is reported that the Council of the British Association for the Advancement of Science has accepted the offer of Mr. A. A. Campbell Swinton to bear the cost of applying for a Royal Charter.

Storm Damage at Blackburn.

We have received from Mr. P. P. Wheelwright, M.I.E.E., engineer and manager of the Blackburn electricity undertaking, the following additional particulars of the damage done to the cooling-tower plant during the gale of a fortnight ago, an illustration of which appeared in our last issue. The two duplex towers, which were dealing at the time with approximately 1,000,000 gal. of water per hour, were demolished about 11.0 p.m. in a few minutes; the speed of the gale was probably about 100 miles per hour. The collapse of the towers fractured the main water circulating pipe by which they were fed, and a heavy volume of water flooded the ground on the southern side of the station and inside the building itself to a depth of several feet. As a result there was a temporary stoppage of the plant and an emergency supply was drawn from the Preston station. A large breakdown gang was soon set to work salvaging. The accident, it is hoped, will not greatly interfere with the normal running of the station. There was no loss of life, in spite of the fact that at the time some men were adjusting valves outside the works. No serious damage was done to the buildings. The position of the Blackburn (East) station is an open and a bleak one, and the towers have withstood, without any damage whatever, two previous gales which were reported at the time as being exceptional in strength and not experienced in the previous quarter of a century. The recent gale, judged by the damage done in that part of the country, might be described as a tornado and probably a similar one cannot be recalled.

A New Solid-Injection Oil Engine.

In a paper which was to be read before the Institute of Marine Engineers, Inc., on November 8th, by Dr. F. Sass, a new type of solid-injection double-acting two-stroke oil engine is described. It is the invention of a Swedish engineer, K. J. E. Hesselman, and manufactured by a German firm. Test results for a 1,000-h.p. engine of this type show a fuel consumption of 0.354 lb. per b.h.p.-hour at full load, and 0.364 lb. at half load.

Belgian Radio Show.

According to *L'Electricité Pour Tous*, the Bourse du Matériel Electrique has been entrusted with the organisation of a wireless *salon* at the Parc du Cinquantenaire, to be held concurrently with the 21st Automobile and Cycle Show, to be held from December 3rd to 14th.

Electricity in Mines.

Prof. Statham, of Sheffield University, addressing the annual meeting of the Notts Mining Students' Association at Mansfield last week, alluded to the use of electricity in mines. The horse-power represented by installations at mines, he said, had increased from 510,760 in 1912 to 1,620,145 in 1927, the average annual increase being 77,000 h.p.

Institution Notes.

Institution of Electrical Engineers.

HONORARY MEMBER.—At the meeting of the Institution on November 3rd the president announced that the Council had that day unanimously elected Mr. T. A. Edison an honorary member.

SOUTH MIDLAND CENTRE.—The annual dinner will be held on Friday, November 25th, at the Grand Hotel, Birmingham. Tickets can be obtained from the hon. secretary, Mr. H. Hooper, 13, Phœnix Chambers, Colmore Row, Birmingham.

MERSEY AND NORTH WALES (LIVERPOOL) CENTRE.—The annual dinner will be held at the University Club, Liverpool, on Wednesday, November 30th. Tickets can be obtained from the hon. secretary, Mr. O. C. Waygood, "Astbury," Forest Road, Hoylake.

Junior Institution of Engineers.

Mr. Robert Lowe, speaking at a meeting of the Institution last Friday on the subject of "Engineering Salesmanship," said that a commercial engineer was born, and not made; the qualities which made a salesman were many, and some of them were peculiar. The engineering salesman had to be engineer and seller too; he had to know his own goods, his competitors' goods, and his customers' requirements. He had to have confidence in his firm, and he had to stand up for it, and yet be quick to recognise a buyer's just complaints. He had to meet and mix with men of high standing and education, and not be out of place. He had (more rarely) to be the whipping boy for the customer who had been let down, and on those occasions he had to restrain his inward feelings. Some of his maxims for intending salesmen were: "Take up commercial engineering before you marry, and never get married. It is a whole-time job." "Never apologise for calling on a buyer, unless you are late." "Never run down your competitors' goods: you may one day have to sell them." "Always let a customer use a strong word first."

North-East Coast Institution of Engineers and Shipbuilders (Inc.).

The annual report of the Council refers to the prolonged depression in the engineering and shipbuilding industries, and records the award of the Engineering Gold Medal to Sir Charles A. Parsons, Mr. R. J. Walker, and Mr. S. S. Cook for their joint paper on turbine machinery. Sir Chas. Parsons received from the King the Order of Merit during the year. The accounts show that the revenue for the past session was £4,101, and the expenditure £4,068.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. F. J. CAMPBELL-ALLEN, A.M.I.E.E., managing director of the Bastian Meter Co., Ltd., was on October 31st promoted to the rank of commander (R.N.) on the Retired List. Commander Allen joined the Navy in 1904, passing out fourth in his term, and was in consequence immediately rated midshipman and later obtained six 1st Class certificates for promotion to lieutenant. He specialised in torpedo work and electricity and served during the war in H.M.S. *London* at the Dardanelles and H.M.S. *Agincourt* with the Grand Fleet, after which he was at the Admiralty and then electrical and torpedo officer in the 1st Submarine Flotilla. On his retirement he joined the late Mr. C. Orme Bastian, and when the latter died the two companies Bastian & Allen and the Bastian Meter Co., Ltd., combined. Commander Allen is now managing director of the combined concern.

Mr. A. W. KER, rolling stock superintendent at the Preston tramways depot, has been presented by the staff and employés with a gold watch and chain on his retirement.

An excellent portrait of Mr. W. L. HICHENS, the new chairman of the English Electric Co., Ltd., appears in the September number of the *English Electric Journal* which is just to hand.

Lieut.-Colonel A. G. LEE, O.B.E., M.C., is the chairman of the Wireless Section of the Institution of Electrical Engineers, and he delivered his address last week. He is Staff-Engineer-in-charge of the Radio Section of the Engineering Department of the General Post Office. He entered the Engineering Department in 1901. During the war he served with the Royal Engineers (Signal Section), receiving the M.C. and being mentioned in dispatches. He is at present lieut.-colonel, Royal Corps of Signals (Supplementary Reserve). Lt.-Col. Lee received the O.B.E. in June, 1927, for work in connection with Transatlantic telephony. He received the Duddell Premium, 1924-5, for joint authorship of a paper on the Leafield coupled arc. He was British delegate to the Inter-Allied Radio Conference in Paris in 1921. His other activities include membership of various committees of B.E.S.A., B.E.A.I.R.A., and the Radio Research Board. Of the "Atmospherics" Committee of the last-named he is chairman.

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Lieut.-Col. A. G. Lee, O.B.E., M.C.

Mr. J. EDWIN STORR, M.I.E.E., M.I.Mech.E., who is chairman of the North Midland Centre of the Institution of Electrical Engineers, delivered his inaugural address on November 1st. He has been in practice as a consulting engineer in Leeds since 1923, and in addition to advisory work on municipal and private electrical undertakings, he has been responsible for the design and execution of many important electrical and heating installations for large public buildings, hospitals, banks, and industrial works. Previous to commencing in practice on his own account he was engaged as superintending engineer to the Yorkshire Electric Power Co. under Mr. W. B. Woodhouse, for over ten years, and earlier still was at Bolton, Croydon, and Lincoln electricity works. Mr. Storr has

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Mr. J. E. Storr, M.I.E.E.,

Chairman of the North Midland Centre of the I.E.E.

travelled extensively on contract work over a period of seven years, including Germany and Canada, particularly on transmission line work.

The *Yorkshire Observer* states that Mr. E. R. RUSHWORTH, electrical engineer of Skipton, has been appointed electrical engineer of Clayton, and will commence his duties there towards the latter end of November. Mr. Rushworth, who was formerly assistant at Bingley, went to Skipton about eight years ago when Skipton first installed electricity.

Mr. J. R. COPPING, chief mechanical and electrical engineer of the Fife Coal Company for the past seven and a half years, was recently entertained at Cowdenbeath and presented with a dining-room clock and ornaments along with a wallet of notes on the occasion of his appointment to a similar position with the Bolsover Coal Company. Mr. Charles A. Carlow, of the Fife Coal Company, who presided, made the presentation. Mr. Copping, in reply, said he had gained valuable experience with the Fife Coal Company and he was going where that experience would come in very useful at one of the largest collieries in the country where one of the pits had the record output and where they were going to equip another at a cost of a million pounds.

Mr. N. HUNTER is terminating his position with the Dover Corporation at the end of November, and is taking up the appointment of district engineer to the Yorkshire Electric Power Co.

The Chloride Electrical Storage Co., Ltd., has appointed Dr. R. E. LANE, M.R.C.P., to devote the whole of his time to the study of lead poisoning in connection with accumulator manufacture. It is hoped that as the result of this appointment, data will be collected which will be of considerable value to the industry.

Bristol Corporation Establishment Committee recommends the increase of the salary of Mr. F. W. PROSSER, the sales manager and secretary of the Electricity Department, from £700 to £800 per annum.

Mr. SYDNEY W. BAYNES, chief electrical engineer to the St. Pancras Borough Council, is retiring from that position at the end of the year. Mr. Baynes has been in the Council's service for 32 years.

Mr. MARSHALL, of Wolverhampton, has been appointed assistant mains engineer, and Mr. GEERNAERT, of Grays, assistant mains draughtsman, in the Islington Electricity Department.

Obituary.—MR. J. E. ADAMSON.—The death is announced, at the age of 68, of Mr. James Edward Adamson, late of the Eastern Telegraph Co., Ltd.

Will.—Major the Hon. W. L. BAGOT, D.S.O., of South Africa, general manager of the Victoria Falls and Transvaal Power Co., Ltd., and chairman of Rand Mines Power Supply Co. at Johannesburg, left unsettled property in England of the gross value of £4,206 (net personalty £1,045).

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

John M. Millar, Ltd.—Private company. Registered in Edinburgh October 27th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of, agents for, and dealers in railway, tramway, electric, galvanic, and other apparatus, instruments, &c. The directors are:—J. M. Millar, 3, Griffiths Street, Falkirk, electrical and automobile engineer; R. M. Millar, 2, Oswald Street, Falkirk, electrical and automobile engineer. Qualification: 100 shares. Registered office: Callendar Garage, Callendar Road, Falkirk.

Hall's Longitudinal Lighting Co., Ltd.—Private company. Registered October 29th. Capital, £5,000 in 1,250 ordinary shares of £1 each and 75,000 deferred shares of 1s. each. Objects: To acquire from J. I. Hall certain letters patent granted to him for an invention relating to lamp reflectors and fittings and the apparatus and machinery therefor (No. 202,721 of 1923), &c. The subscribers (each with one deferred share) are:—T. G. Simpson, 5, Victoria Street, Westminster, S.W.1, engineer and contractor; J. I. Hall, 3, Junction Chambers, London Road, Kingston-on-Thames, Surrey, mechanical and electrical engineer; T. G. Simpson signs documents as director. Qualification: 1 ordinary or 1 deferred share. Remuneration (except managing director, if any), £200 per annum. Registered office: 5, Victoria Street, Westminster, S.W.1.

British Lighting and Ignition Co., Ltd.—Private company. Registered October 31st. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of magnetos, starting and lighting sets for motor cars and other vehicles, &c. The first directors are:—H. J. Sayer, Beechcroft, Belle Walk, Moseley, Birmingham; P. F. B. Bennett, Ardencote, Luttrell Road, Four Oaks, Sutton Coldfield, Warwickshire; O. Lucas, 15, Westbourne Road, Edgbaston, Birmingham (all directors of Joseph Lucas, Ltd.). Registered office: Well Street, Birmingham.

Sun-Vi-Lite, Ltd.—Private company. Registered October 29th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in ultra-violet ray and other electrical apparatus, wires, cables and lines of all kinds, electricians, &c. The directors are:—J. J. Rawlings and R. J. Rawlings, Rosindell, The Cliffs, Westcliff-on-Sea; R. M. Hale, Cranbourne, Cobham, Surrey. Qualification: 400 shares. Registered office: 89, Chancery Lane, W.C.2.

Radiovisor, Ltd.—Private company. Registered October 31st. Capital, £12,000 in 11,000 preference shares of £1 each and 20,000 ordinary shares of 1s. each. Objects: To acquire from J. Neale the benefit of certain existing inventions relating to an improved process for manufacturing selenium cells, improvements in relays, improved means of operating fire alarms and extinguishers, means for effectively actuating light sensitive bridges during mist or white fog, a novel method of constructing and operating selenium cells, an improved instrument for measuring densities and light and an improved microphone, together with such rights as the said J. Neale has in the trade mark "Radiovisor." The subscribers (each with one share) are:—J. Neale, 15, Acacia Road, St. John's Wood, N.W.8, civil engineer; C. L. F. Clutterbuck, 17, St. James's Avenue, Brighton, engineer. J. Neale shall be permanent director and chairman so long as he holds 10,000 ordinary shares. Qualification as directors: 1 ordinary share. Registered office: 26, Church Street, Charing Cross Road, W.1.

Dartford Ironmongery Co., Ltd.—Private company. Registered November 1st. Capital, £6,000 in £1 shares. Objects: To carry on the business of ironmongers, electrical engineers, radio engineers, and manufacturers of and dealers in radio and telephone goods, &c. The first directors are:—J. W. Ellingham, Cold Blow, Bexley; F. W. P. Finch, Brendene, Watling Street, Dartford; E. A. White, 43, Mickledever Road, Lee, S.E.1. Registered office: The Old Post Office, 26, Lowfield Street, Dartford.

A. P. Lundberg & Sons, Ltd.—Private company. Registered October 29th. Capital, £30,000 in £1 shares. Objects: To carry on the business of electrical, telegraphic, mechanical and general engineers, manufacturers of electric switches and accessories, watertight apparatus, switchboards and accessories for automobiles, dynamos, motors, airships or aeroplanes, lighting, heating and power plant, radio-telegraph apparatus, &c. The permanent directors are:—G. C. Lundberg, 6, Highcroft Road, Hornsey Rise, N.19, electrical engineer; P. A. Lundberg, 23, Eversfield Place, St. Leonards-on-Sea, electrical engineer. Qualification: £500 shares. Remuneration: £600 each per annum. Registered office: 477-489, Liverpool Road, N.7.

Radielle Co., Ltd.—Private company. Registered November 2nd. Capital, £1,650 in 150 ordinary, 500 7½ per cent. non-cumulative preferred ordinary, and 1,000 6 per cent. cumulative preference shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in all kinds of electrical, musical, radio and other instruments and apparatus, &c. The first directors are:—J. B. Hawkins, 12, Sandringham Road, N.W.11; F. R. Payne, 50, Southway, N.W.11; D. E. Hickey, 79, Clifton Court, St. John's Wood Road, N.W.8. Registered office: 56, Crogsland Road, Chalk Farm, N.W.1.

Electradio Co., Ltd.—Private company. Registered November 2nd. Capital, £1,000 in £1 shares. Objects: To acquire the business of a radio expert, manufacturer of and dealer in radio apparatus and accessories, musical instruments, sports goods, &c., now carried on by Annie Silver-Black as the "Electradio Company," at 25, Westbourne Grove, W.2. The first directors are:—Annie Silver-Black (permanent director and chairman), and Alfred Silver-Black, both of 25, Westbourne Grove, W.2. Registered office: 25, Westbourne Grove, W.2.

Radio Installations, Ltd.—Private company. Registered November 4th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers, importers and letters on hire of, and dealers in all kinds of mechanical, electrical,

and wireless goods and scientific instruments, &c. The directors are:—H. G. Brameld (secretary of "Santa Maria" S.S. Co., Ltd.; and P. Brameld, Low Wood, Woldingham, Surrey. Secretary: H. G. Brameld. Registered office: 24, Great St. Helens. E.C.3.

Bitax Manufacturing Co. (Scotland), Ltd.—Private company. Registered in Edinburgh October 27th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical goods, &c. The directors are:—B. Fox, 486, Oxford Street, London, W.1, merchant; S. Racionzer, sales manager, and B. Racionzer, 66, Sinclair Drive, Glasgow. Registered office: 66, Sinclair Drive, Glasgow.

Official Returns of Electrical Companies.

Climax Vacuum Cleaner Co., Ltd.—Debenture dated October 21st, 1927, to secure £1,780, charged on the company's undertaking and property, present and future, including stock, book debts, &c. Holder:—H. F. Cates, 17, Northanger Road, Streatham, S.W.16.

J. H. Runbaken, Ltd.—S. Barlow, A.C.A., of 14, John Dalton Street, Manchester, ceased to act as receiver and manager on October 19th, 1927.

Camborne Electricity Supply Co., Ltd.—Capital, £20,000 in £1 shares. Return dated May 26th, 1926. All shares taken up. £20,000 paid. Mortgages and charges, nil.

Bude Electric Supply Co., Ltd.—Capital, £15,000 in £1 shares. Return dated May 31st, 1927. 10,000 shares taken up. £10,000 paid. Mortgages and charges: £2,500 mortgage debentures.

Wilfrid Francis & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 30th, 1927. 465 shares taken up. £465 paid. Mortgages and charges, nil.

F. B. Hellon & Co., Ltd.—Capital, £4,000 in £1 shares. Return dated June 10th, 1927. 3,000 shares taken up. £3,000 paid. Mortgages and charges, nil.

Underwood (Manchester), Ltd.—Satisfaction to the extent of £1,500 on October 17th, of "A" debentures dated April 28th, 1927, securing £7,400.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,500 on September 30th, 1927, of charge dated March 8th, 1911, securing £60,000.

Guy V. Laycock Ltd.—Capital, £10,000 in £1 shares. Return dated June 7th, 1927. 5,200 shares taken up. £1,200 paid, £4,000 considered as paid. Mortgages and charges, nil.

Courtin & Walsh, Ltd.—Debenture dated October 25th, 1927, to secure £1,325, charged on the company's undertaking and property, present and future. Holder: F. F. Evans, Lyndhurst Cottage, Rydens Avenue, Walton-on-Thames.

J. B. Saunders (1923), Ltd.—Capital, £5,000 in 1,000 preference and 4,000 ordinary shares of £1 each. Return dated May 5th, 1927. 795 preference and 4,000 ordinary shares taken up. £4,795 paid. Mortgages and charges, nil.

Anglo-Portuguese Telephone Co., Ltd.—Trust deed dated October 19th (supplemental to trust deed dated February 1st, 1927, to secure £13,200 debenture stock and premium of 2 per cent. charged on property, assets, and undertaking charged by the original deed. Trustees: H. Allen, 31, Budge Row, E.C.; and the Second Consolidated Trust, Ltd., Dashwood House, Old Broad Street, E.C.

Lydbrook Cables, Ltd.—Satisfaction in full on June 29th, 1927, of debenture dated February 15th, 1926, securing £37,500. (Notice filed October 26th.)

Dyer & Young, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated October 14th, 1927, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Cleveland and Durham Electric Power, Ltd.—Capital, £700,000 in 350,000 preference and 350,000 ordinary shares of £1 each. Return dated March 30th, 1927. 333,705 preference and 157,600 ordinary shares taken up. £411,003 paid on 331,935 preference and 79,068 ordinary shares, £80,302 considered as paid on 1,770 preference and 78,532 ordinary shares. Mortgages and charges: £316,300.

Prestograph Sign Works, Ltd.—E. E. Mills, 57-58, Chancery Lane, W.C.2, was appointed receiver and manager on October 26th, 1927, under powers contained in debentures dated August 13th, 1926.

Johnson & Phillips, Ltd.—Capital, £700,000 in £1 shares. Return dated May 19th, 1927. 600,000 shares taken up. £431,635 paid, £168,365 considered as paid. Mortgages and charges: £273,906.

Humavox, Ltd.—E. P. Warner, 75, New Street, Birmingham, ceased to act as receiver or manager on October 22nd, 1927.

Bridgewater and District Electric Supply and Traction Co., Ltd.—Capital, £30,000 in 5,000 preference and 25,000 ordinary shares of £1 each. Return dated April 25th, 1927. 2,657 preference and 15,000 ordinary shares taken up. £8,785 paid on 2,657 preference and 6,118 ordinary shares, and including £10 paid on 100 forfeited shares. £8,882 considered as paid on 8,882 ordinary shares. Mortgages and charges: £14,400.

Alderley & Wilmslow Electric Supply, Ltd.—Capital, £55,000 in 10,000 10 per cent. cum. preference, 10,000 5 per cent. preference, and 35,000 ordinary shares of £1 each. Return dated August 9th, 1927. 10,000 10 per cent. preference and 32,500 ordinary shares taken up. £42,500 paid. Mortgages and charges: £15,000.

City Notes.

Atlas Light and Power Co., Ltd.

The annual meeting was held on November 3rd, Sir George A. Touche, Bt., presiding. In presenting the report and accounts (ELEC. REV., October 28th, p. 740), the chairman said that the company's change of title had caused it to emerge from a position of comparative obscurity to one of some prominence in the electrical investment sphere. Competent observers had predicted that electrical development would be a prominent factor in the future of Argentina; at present the economic situation in that country was satisfactory and was improving. Cordoba was growing rapidly; it was the third city of the Republic. Santa Fé had also made remarkable progress and the company was now constructing a large power station there. Parana was also a centre of considerable activity; it was a port situated opposite Santa Fé on the River Parana. The latest acquisition of the company was a controlling interest in the Tucuman Tramways, Light & Power Co. That company, through subsidiaries, operated hydro-electric and steam stations under concessions from the municipality and provincial government. There was also a small tramway system about 13½ miles long. No revenue from the Parana or Tucuman undertakings was included in the accounts presented. Both the Cordoba and Santa Fé undertakings reported record business. Their relations with the provincial and municipal authorities of Cordoba had been most cordial. The balance of the municipal indebtedness had been paid off and the interest on the debt had been credited to the revenue account; that had enabled them to write off the whole of the expenses of the creation and issue of debenture stock and shares. The installation of a new 1,000-kW generator in Santa Fé had prevented any interruption of supply, but the business had already caught up on the capacity of the station. A new power station was being built, and from this the supply would be extended to various places in the neighbourhood. The net receipts in Cordoba, excluding interest received on the municipal debt, had risen by about £26,000, and those in Santa Fé by about £8,000. During the three months of the company's operation of the Montevideo undertakings the net receipts were £93,756. The total net receipts had thus risen from £300,000 to £430,000. The chairman then reviewed the company's accounts in some detail and later referred to the necessity for further capital. He said that a controlling interest in the Tucuman Tramways, Light & Power Co., Ltd., had been secured on the basis of an exchange of securities. The directors desired to repay the £150,000 of 7 per cent. notes issued by the United Electric Tramways of Montevideo, Ltd. It was therefore the intention to make an issue of debenture stock and preference shares at an early date. The report and accounts were adopted.

Erinoid, Ltd.

Presiding at the annual meeting on November 3rd, the chairman (Mr. Andrew Binnie) said that the result of the past year's working had been disappointing. The main cause had been the flooding of the market by competitors with inferior material at very low prices. During the latter part of the year business had improved and if the sales were maintained at their present level the year's working should show a substantial improvement. The rush of business in the last four months of the year had depleted their cash resources to such an extent that the directors considered it advisable to dispose of the unissued shares; that was done at the price of 7s. 3d. each and the premium on the issue had been carried to reserve. The debentures had been redeemed by means of a loan on advantageous terms. The company had ample depreciation and taxation reserves. The French Company had done well, but the depreciated exchange had adversely affected the sterling result. There was no revenue from the American company, but a contribution was expected during the current year.

International Aluminium Co., Ltd.

During the week this company published particulars of its constitution, objects, &c. Originally formed as a private company in 1908, it was converted into a public company in December last. It has a fully issued share capital of £500,000 (£250,000 10 per cent. preference and 250,000 ordinary shares of £1 each) and £500,000 of 7½ per cent. debenture stock

(£250,000 issued). The company owns alumina works at Hebburn-on-Tyne and has entered into a contract with the Aluminium Corporation, Ltd., for the acquisition of its rights and interests in an agreement with the Norwegian Government for the lease of a hydro-electric undertaking at Glomfjord, where the Haugvik Works will be operated by hydro-electric power for the production of aluminium.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Stock Exchange Committee under Rule 159:—

Bognor Gas and Electricity Company.—£20,000 additional ordinary consolidated stock "A," fully paid; £13,830 new additional ordinary consolidated stock "A," fully paid.

Electric Supply Corporation.—50,000 new ordinary shares of £1 each, issued at £1 11s. per share, fully paid, Nos. 200,001 to 250,000; 81,300 new six per cent. cumulative preference shares of £1 each, issued at £1 0s. 6d. per share, fully paid, Nos. 168,701 to 250,000.

Chiswick Electricity Supply Corporation, Ltd.

An extraordinary meeting was to be held yesterday (Thursday) to consider a resolution providing for the doubling of the capital by the creation of 100,000 shares of £1 each. When the resolution is confirmed the directors intend to offer 50,000 of the new shares to existing shareholders, in the proportion of one new share to each two held, at the price of 21s. each, representing a considerable bonus. The capital expenditure of the company already exceeds considerably the issued capital and further capital is needed for the extension of plant to meet the steadily-growing business in Chiswick and Aberystwith.

Joseph Lucas, Ltd.

Speaking at the annual meeting last week, the chairman (Alderman H. J. Sayer, J.P.), made reference to the purchase of £56,000 of preference shares of Rotax Motor Accessories, Ltd., and to the reorganisation of C. A. Vandervell & Co., Ltd. They were satisfied with the progress made by both companies both of which had paid dividends. Economies effected at the various works had enabled them to reduce their prices. Mr. H. Lucas mentioned that the company had produced a device for overcoming the "dazzle" trouble in motor headlights; this had been very favourably received.

Perak River Hydro-Electric Power Co., Ltd.

The first report of this company, covering the period from July 24th, 1926, to July 31st, 1927, states that orders for practically the whole of the plant for the hydro-electric and steam stations and distribution system were placed during the year. There has been a satisfactory response from potential customers and the company has decided to install a second steam unit of 6,000 kW. It is anticipated that the company will be in a position to commence a supply from its steam station in August next year. The meeting was held on November 8th.

Lighting Trades, Ltd.

The report of this company (which incorporates J. and W. B. Smith, Ltd.), for the year ended March 31st last, records a profit of £14,475 as compared with a loss of £466 in the preceding year. After meeting depreciation and preference dividend and placing £5,000 to general reserve, £3,299 is carried forward.

Companies to be Struck Off the Register.

Notice has been given that the following companies will be struck off the register, three months from November 4th, unless cause is shown to the contrary:—

Lancaster and District Tramways Co., Ltd.
Lighting, Heating and Power Installations Co., Ltd.
Wholesale Electrical Co. (1922), Ltd.

Norwich Electric Tramways Co.

The net profit for the year ended June 30th last was £22,754, as compared with £20,390 in the preceding year. The addition of £1,435 brought forward makes available £24,189, and it is proposed to distribute this as follows:—To reserve, £10,000; dividend of 4½ per cent. (against 4 per cent.); carried forward, £2,309. The report notes an increase in the company's omnibus services.

William Beardmore & Co., Ltd.

At a meeting of the holders of the company's 8 per cent. notes, on October 31st, a resolution was adopted postponing the payment of interest and the repayment of principal until November 1st, 1928.

Manaos Tramways and Light Co., Ltd.

The directors have declared a distribution of interest at the rate of 3½ per cent. upon the 7 per cent. participating debentures for the year ended April 30th.

Radio Corporation of America.

The gross income for the quarter ended September 30th was $16,773,091, and the surplus profit was $3,588,989, making the surplus for the first nine months of the year $4,141,355.

Consolidated Gas, Electric Light and Power of Baltimore.

A dividend of $½ per common share has been declared in respect of the quarter ending December 31st.

Marconi's Wireless Telegraph Co., Ltd.

The company's petition for the reduction of its capital from £4,000,000 to £2,374,954, by writing 10s. off the £1 ordinary shares was before Mr. Justice Eve on November 8th and subsequent days. There was opposition on the part of a number of shareholders. Senatore Marconi was too ill to attend the Court but an affidavit sworn by him was put in in support of the petition.

National Telewriter Co., Ltd.

The directors have decided to pay a dividend of 1 per cent. on the preferred ordinary shares out of a profit of £1,379 for the year ended June 30th last.

W. T. Henley's Telegraph Works Co., Ltd.

The directors have declared an interim dividend on the ordinary shares of 1s. 6d. per share.

Siemens Bros. & Co., Ltd.

The directors have declared an interim dividend of 2½ per cent., as in 1926.

Stocks and Shares.

MONDAY EVENING.

STOCK EXCHANGE markets have arrived at that condition which makes for a little hesitation on the part of the investor, a little reluctance on that of the speculator, in regard to an immediate increase of commitments. With Christmas only seven weeks off, and the hint that this conveys of possibly dearer money, the investor is inclined to be rather more discriminating than usual. He has a fairly good selection of stocks from which to make his choice, but will probably lament the difficulty that he experiences in obtaining the particular security that he wants. That this is a just complaint which any Stock Exchange member will endorse, for good stocks are held with extreme tenacity. The speculator on the bull tack has found himself unexpectedly out of pocket in certain markets, and is walking a little warily in consequence. Business is tolerably active, notwithstanding the handicaps placed upon it by the factors just mentioned.

Undergrounds.

Prices in the group of Underground Railways have been unfavourably affected by the announcement that an expenditure of £2,500,000 is estimated in connection with the projected scheme for overhauling the rolling stock and equipment. Two years are likely to be required for the completion of the work. Faster and longer trains are wanted on the District Railway. The new rolling stock provided as new Tube extensions have been opened, is to become the standard towards which replacement of old equipment will be directed. The Stock Exchange saw in these proposals a possibility of fresh money having to be raised. Prices of the existing issues promptly eased off. Subsequent denial of the idea that new capital will be forthwith required was followed by a rally in quotations. Districts and Metropolitans are unchanged on the week. Underground £1 shares fell 1s., but regained most of the loss and at 19s. 3d. are threepence down on balance.

Provincial Light and Power.

Provincial lighting and power shares remain popular. The principal rise has been secured by Newcastle-on-Tyne ordinary, the price advancing 1s. 9d. to 23s. 9d. on the assumption that last year's 5 per cent. dividend will be followed by 7 per cent. for 1927. According to accounts, the company is doing well, and the progress for the current year will be free from any such disaster as the coal and general strikes which caused the setback in the dividend last year. Yorkshire Electrics strengthened to 32s. Improvements of 1/16 in each case have lifted Edmundsons to £2, Urbans to 33s. 9d. The Chiswick Electricity Supply Corporation convened a meeting for Thursday in this week to consider a resolution for creating 100,000 new ordinary shares of £1 each, which would double the existing shares. Money is required for extension of the company's business at Chiswick and Aberystwith. The directors propose to offer 50,000 new shares, at 21s. each, by way of rights, giving one new for every two shares now held. A fortnight ago, Chiswick ordinary stood at 55s. They rose to 57s. last week, and are now 60s. The new issue will therefore constitute a handsome bonus to shareholders, who should on no account throw away their allotment-letters as being mere circulars, because they will be saleable at a substantial premium.

Concerning Rights.

Digression may perhaps be pardoned for mentioning that in the case of every new issue which involves rights, a certain proportion of proprietors refuse to do more than glance at proposals that ask for the provision of more money. This is

peculiarly so, experience shows, with industrial companies whose shares are largely in the hands of investors with little knowledge of Stock Exchange affairs. Such people, unless they have money handy for taking up new shares, will destroy, as circulars, allotment-letters that can be sold forthwith at a premium, and which call for the putting up of no new cash by allottees if the latter do not care to retain the shares. Some companies nowadays go to the trouble of impressing upon their proprietary, through the attachment of red-ink notices to the letters of allotment, the fact that the shares carry a market value or premium. This is as it should be, although secretaries may claim that no obligation, moral or otherwise, rests upon them to inform shareholders of their good fortune. What happens to the cheap shares that are not accepted by those people who forfeit their right to such advantages, is a matter upon which there are probably diversities of operation.

Wireless.

The Marconi market has been in a state of lively agitation. The violent rise from £1 to 37s. 6d.: the equally abrupt slump to 25s. 9d.: the rally to 28s. 9d. have all succeeded each other so breathlessly that the shareholder may well wonder what he ought to do now. The present price is difficult to justify on any of the usual grounds of dividend-yield or of anticipation that the company will make good returns in the immediate future. The attractions lie well ahead and it is upon these that the optimist is banking when he decides to "see the thing through." As to the commanding situation occupied by the Marconi Company, no doubt can be entertained. The speculation, a very interesting one, resides in the extent of profitable use to which this situation can be put. Marconi Marines hold their previous price. Canadian Marconis have dropped back to 7s.

The Manufacturing Group.

Henleys have declared an interim dividend of 7½ per cent. Johnson & Phillips announce 5 per cent. interim. Both are at the same rate as those of a year ago. The market had been looking for these dividends. Johnsons remained at 2½. Henley's have gone back 2s. 6d. to 5½; the reaction had nothing to do with the dividend declaration. Slightly easier conditions prevail throughout the list of manufacturing shares as a whole. Siemens weakened to 31s. 9d. Metropolitan-Vickers ordinary dropped to 27s. 6d., Electric Constructions, at the same price, showing 1s. loss. Babcock & Wilcox are a good market. Shares have changed hands over 60s. and there are buyers at the middle price of £3. An interesting sign of the times, and a further illustration of the popularity of amalgamations, is a fusion of Vickers and Armstrongs, as regards part of their undertakings. The three sections to be combined are the shipbuilding, heavy steel, and armament branches. As precise details will no doubt be published before the end of this week, there is little use in speculating upon possibilities here, but we may record that the first effects of the announcement were sharp rises in all the Armstrong issues. The debentures gained 5 to 10 points. Vickers gained a trifle, the ordinary shares, written down as they were recently to the nominal value of 6s. 8d., strengthening to 12s. The £1 shares in Armstrongs, which have not been re-classified—to adapt an elegant American euphemism—put on 1s. 3d. to 5s. 3d. It is thought that the arrangement between these two powerful firms may prove to be the prelude to similar amalgamations between other companies engaged in the iron, coal and steel trades.

Great Northern Telegraphs.

The mysterious rise in Great Northern Telegraphs is still the outstanding feature amongst cable stocks and shares. Another advance, this time of 35s., carried up the price to 38¼. Copenhagen professes to be as much in the dark as London is, and cannot account for the movement. Hints abound as to the buying being for purposes of control. The price has risen about 40 per cent. in three months. Eastern Telegraph and others in their group are heavy. Holders of the stocks are manifestly uneasy at the possibilities of wireless competition. United River Plate Telephones have improved to 10¼.

Power Companies Abroad.

Perak River Hydro Electric shares at 14s. have gained 1s. 3d. upon the issue of a cheery report from the company. What the market likes is the statement that the Board anticipates being able to start a supply of power, from the steam station, by August next year. Amongst Indian issues, Madras Electric Supply ordinary are better at 33s. 9d. The Mexican issues are inclined to weaken. Mexico Tramways fell to 24½ and the company's 6 per cent. bonds shed a couple of points to 72½. Pachuca Fives have receded to 67. On the other hand, Brazilian Tractions, moving as meteorically as ever, are 6 higher at 202, the preferred at 169 being 5 up. Both shares have been still better during the past few business days. London traffic varieties are somewhat irregular. A gain of 2, to 58½, in London United Tramways 4 per cent. debenture is balanced by a decline of 6d., to 1s. 9d., in the price of the company's ordinary shares. Interest in the London shares has quietened down, possibly because of rumours to the effect that Parliament is not likely to take any definite step until next year in the way of unifying traffic control in London. The rubber share market is better on a trifling improvement in the price of the raw material.

Share List of Electrical Companies.

	Nom. £	Dividend. 1925.	Dividend. 1926.	Price Nov. 7 1927.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	1	14	14	58/3	—	4 15 9
Brompton Ordinary	1	10	8⅝	24/6	—	5 14 3
Charing Cross Ordinary	1	15	8½	26/-	+6d.	5 7 8
do. do. 4½ Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8⅝	24/6	—	5 14 3
City of London	1	15	7½	28/9	—	4 17 5
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	29/6	—	4 18 6
County of London	1	15	7½	27/-	—	5 3 8
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	8	10	40/-	+1/8	5 0 0
do. 7% Pref.	1	6	7	24/6	—	5 14 3
Elec. Supply Corporation	1	10	10	32/6	—	6 3 0
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	24/6	—	5 14 3
do. do. 6% Pref.	5	6	6	5⅝	—	5 11 3
Metropolitan	1	11	8	30/-	—	4 18 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	5½	6	24/-	—	5 0 10
Newcastle-on-Tyne Ordinary ...	1	7	5	23/9	+1/9	4 4 3
do. 5% Pref. ...	1	5	5	17/6	—	5 14 3
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	26/-	+6d.	5 7 8
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	7	7	1 1/16	+1/16	4 8 0
do. 6% Pref.	1	6	6	1 1/16	—	5 12 0
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	32/-	+6d.	5 0 0
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	71	—	5 12 8
Metropolitan	,,	5	8	60	—	5 0 0
do. District	,,	8½	8½	63½	—	5 10 3
Underground Electric	£1	Nil	1½	19/3	—9d.	1 11 0
do. do. Income ...	Bonds	6	6	104	—	5 15 5
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	8	10	48/-	—	4 3 4
Chili Telephone	5	5	6	7⅝	—	3 18 3
Eastern Extension	10	10	10	17½	—	*5 14 8
Eastern Tel. Ord.	Stock	10	10	173	—	*5 15 7
Globe Tel. and T. Ord.	10	10	10	17⅜	—	*5 13 4
do. do. Pref.	10	6	6	10⅝	—	5 10 4
Great Northern Tel.	10	20	20	38½	+1½	5 4 7
Indo-European	25	8½	10	43½	—	*5 14 11
Marconi	1	Nil	Nil	28/9	—	... ...
Marconi-Marine	1	7½	8½	31/3	—	5 12 0
Oriental Telephone Ord.	1	12	12	53/6	—	*4 9 4
United R. Plate Tel.	5	8	8	10⅝	+3/9	*3 13 7
Western Telegraph	10	10	10	17½	—½	*5 16 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	8½	—	7 17 2
do. do. 2nd Pref. ...	5	6	6	8 7/16	—	8 8 6
do. do. 5% Deb. ...	Stock	5	5	74½	—	6 14 3
British Electric Traction Def. Ord.	,,	8	8	500	—	... ...
do. do. 8% Pref. Ord.	,,	6	8	124½	+4	6 8 6
Brazil Traction	100	5	6	204	+6	2 19 9
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	99½	—	5 6 11
do. do. Preferred ...		6⅞	6⅞	145½	—2½	4 6 0
do. do. Deferred ...	,,		8	188	—2	*4 5 1
do. do. Deb. ...	,,	4¾	4¾	80½	—	5 5 11
London & Sub. Trac. 6% Pref. ...	1	Nil	Nil	9/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	58½	+2	6 16 9
Mexico Trams, 5% Bonds	—	5	5	76	—	6 11 7
Mexican Light Common	100	Nil	Nil	53	—	Nil
do. Pref.	100	Nil	Nil	72	—	Nil
do. 1st Bonds	—	5	5	77½	—	6 7 6
Yorkshire (West Riding)	1	5	—	7/6	—	... ...
Manufacturing Companies.						
Babcock & Wilcox		18	18	3	+2/-	4 6 3
British Aluminium Ord.	1	12½	10	44/6	—	4 9 11
British Elec. Transformer Pref. ...	1	Nil	7	18/8	—	7 18 6
British Insulated Ord.	1	15	15	9 1/32	—	3 16 2
Brush Ord.	1	10	10	28/9	—	6 16 4
Callenders	1	15	15	9 1/32	—	3 16 2
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	Nil	Nil	16/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 1
Electric Construction	1	10	7½	27/6	—1/8	5 9 1
Enfield Cable Pref.	1	7½	7½	25/-	—	6 0 0
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	8	—	13/-	—	... ...
Gen. Elec. Pref.	1	6⅜	6⅜	24/6	—	5 6 1
do. Ord.	1	7½	7½	34/6	—	4 6 1
Henley	1	20	25	5½	—⅛	4 15 3
do. 4½% Pref.	5	4½	4½	4½	—	5 8 0
India-Rubber	1	5	5	20/6	—	*4 17 7
Johnson & Phillips	1	17½	12½	50/-	—	5 0 0
Met.-Vickers Ord.	1	8	8	27/6	—1/8	5 16 5
do. Pref.	2	8	8	2⅛	—	6 4 8
Siemens Ord.	1	7	7½	31/9	—9d.	4 14 6
Telegraph Construction	10	10	10	29½	—	*4 1 7

* Dividends paid free of Income Tax.

The New Showrooms at Battersea.

The Borough Council's Electrical Display.

ELECTRIC House, which was recently opened by the Mayor of Battersea, Councillor W. H. Humphreys, J.P., is situated in the main thoroughfare of Battersea, Lavender Hill. The premises have an imposing frontage of nearly 65 ft., and, including the basement, occupy six floors, the elevation rising to a height of 54 ft. The exterior is lighted by means of "Gecoray" floodlights, eight in number, one at the top and bottom of each of the four columns. These floodlights are fixed in special shells on standards designed by the architect. Window boxes containing flowers are on the first floor, and these can be illuminated by means of trough lighting. The facia is also illuminated along the whole length by means of trough lighting, which is concealed in a marble cornice specially designed to take these lamps.

Fig. 1.—The Main Entrance Hall.

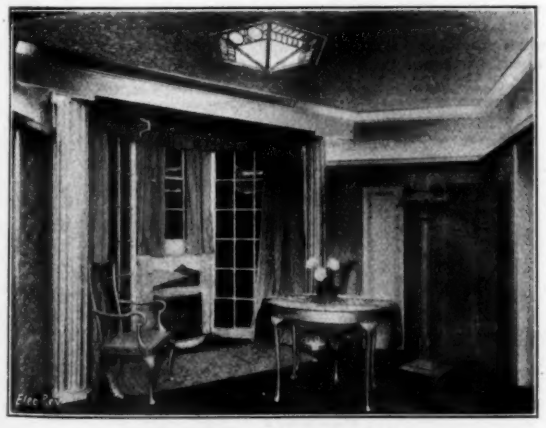


Fig. 2.—The Drawing Room.

The basement consists of showrooms, stores, &c., equipped with a representative display of fittings and appliances by leading manufacturers. The chief feature of the premises is a very artistically decorated and furnished main entrance hall (fig. 1), on each side of which are three rooms. The hall is lighted by means of cornice lighting, in the centre is a specially designed fountain lit and operated electrically and round the walls are show-cases illuminated by "Linolite." The back portion of the hall is panelled in walnut, and has a specially designed reflector fitted in a cornice, which is so arranged that the light is thrown down on to the top of the panelling and up to the ceiling. In this department the consumers' accounts are paid. A columned opening leads into an oak hall which gives an entrance to the lift. In this hall there is a stone fireplace with an electric log-fire, and an electric clock of the grandfather type, containing the master movement for all the clocks in the building. The rooms on either side of the main hall comprise a drawing room (fig. 2), kitchen (fig. 3), dining room, bathroom and bedroom. These are complete in every respect and of normal dimensions. Features of the drawing room are a glass panel fitting, in the centre of the ceiling, which gives an even illumination, and an alternative choice of lighting by means of "Linolite" around the cornice. An electric fire, fitted in a marble hearth, is installed in the window. With a view to attracting the local tradesmen, one room has been set aside for lighting demonstrations. These include a model shop window showing various lighting and spotlighting effects, and a series of demonstration cases loaned by the E.L.M.A. The first floor includes the borough electrical engineer's office and a large lecture hall, which is provided with a suitable demonstration platform. The upper floors are devoted to the clerical staff, and also a small all-electric flat on part of the fourth floor. A feature worthy of note is that most of the rooms are equipped with different electric lighting apparatus representing most modern methods of illumination. Electric water heaters of various manufacturers are installed in the lavatories, demonstration hall, and kitchen. The display windows occupy practically the whole of the frontage, the remainder being given to a cartway to a sub-station and a depôt to be used for highway purposes at the rear of the premises. The windows are equipped for colour- and spot-lighting schemes. The building is electrically heated throughout. The whole of the work has been carried out by direct labour, Mr. W. T. A. Hayward, the borough surveyor, being responsible for the constructional work, and Mr. Hyam for the interior decoration.

The Council's charge for electricity for lighting to ordinary consumers is 4d. per kWh, but it also has an alternative rental wiring system whereby the consumer may have electricity installed free of initial cost, paying a quarterly charge to cover the cost of installation (which terminates when the cost has been met), and a standard charge toward the cost of electricity used, plus 1d. per kWh. There is also a system for the hire of appliances, and for 1s. per week a cooker,

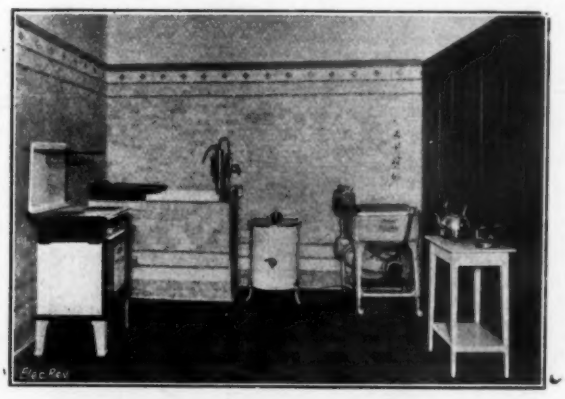


Fig. 3.—The Electric Kitchen.

kettle and iron can be hired the charge for heating and cooking being 1d. per kWh. With such favourable charges the Council should be assured of a rapid increase in the domestic consumption of electricity.

In conclusion, our thanks are due to Mr. F. A. Pond, borough electrical engineer, to Mr. F. H. Howell, commercial assistant engineer, and Mr. H. F. J. Thompson, chief assistant engineer, for their courtesy in showing us round the premises.

An Electrically-Welded Boiler.

What is claimed to be the first completely electrically-welded Cornish boiler without any riveting has recently been completed by the Swiss Locomotive and Machine Works of Winterthur, Switzerland, for a Swiss tannery. The boiler, which has a heating surface of 430 sq. ft., is intended for a working pressure of 185 lb. per sq. in. The tubes were Quasi-Arc welded, the longitudinal seams being reinforced on both sides by Hoehn-type butt joints.

The "Metesco" Ring Breaker.

Apparatus designed primarily for facilitating ring-main connections for h.p. consumers.

THE growth of the electrical distribution system inevitably brings with it the problem of how best to meet the increased loading of the individual consumer. The difficulties of supplying separate loads of the order of 100-kVA and upwards render it practically necessary to take the h.p. supply direct to a transforming point on the consumer's premises, and where there is a ring main this procedure of necessity involves the looping in and out principle. To effect this by means of the ordinary cubicle-truck apparatus is very costly, and in cases where the load is small or none too lucrative almost prohibitive. Further, it is next to impossible to obtain sufficient space in most consumers' premises to install the ordinary type of apparatus.

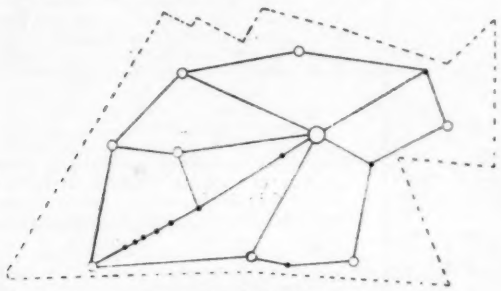


Fig. 1.—Ring-Main Scheme.

It is interesting to learn of the successful efforts that have been made by Mr. A. F. Harmer, A.M.I.E.E., of the Metropolitan Electric Supply Co., Ltd., to overcome these difficulties in connection with a scheme he has prepared for h.p. distribution in a London area. The idea was to provide a lay-out which would permit the addition of any number of transforming points in the area, as occasion arose, employing a uniform size of cable throughout, 0.2 sq. in. A "fringe" ring main was run round the area and connected to the central source of supply by means of "spokes," fig. 1. As the load increases additional "spokes" may be put in, or tie cables can interconnect any of the "spokes." For the connection of large consumers, such as stores and blocks of flats

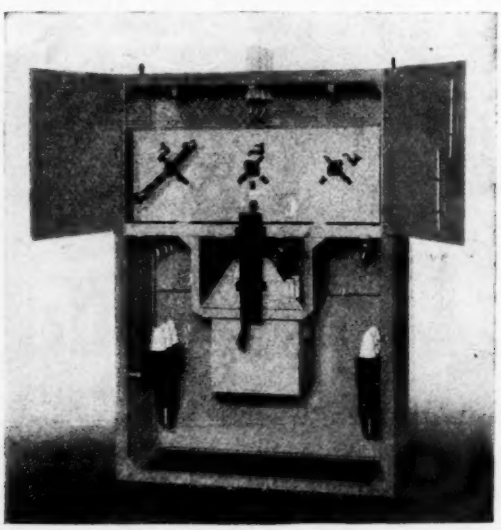


Fig. 2.—The "Metesco" Cubicle.

and offices, on either of the ring main, "spokes" or ties, the "Metesco" ring breaker was devised. This apparatus provides for looping in and out, breaking the "ring" without interrupting the supply, isolating the consumer's transformer, and feeding the transformer from either side of the "ring." Further, the space required for the equipment is small compared with that taken by truck-type switchgear, and, it is claimed, the cost is much lower.

The apparatus consists essentially of an angle-framed steel cubicle containing two isolating switches, a selector switch, a main oil circuit breaker, and the necessary terminal boxes for the cable loops. The cubicle measures 5 ft. 9 in. high, 3 ft. 9 in. wide, and 1 ft. 9 in. deep, so that when placed against a wall the space occupied is not very considerable. Fig. 2 shows internally the complete apparatus. The trifurcating boxes may be used vertically, as shown, or in a horizontal position to suit the cable arrangements; further, they may be fixed externally to the cabinet on a level with the isolators. Fig. 3 depicts the arrangement of connections. The oil circuit breaker (rectangle), of course, forms the main connection for the "ring." Between this and the cable loops, on either side, are fixed the isolator switches. The selector switch connects directly between the isolators.

The isolator and selector switches are made up as a complete selector unit, fig. 4. The switches are of the rotary type and are provided with definite locking arrangements; the blades of the selector are, of course, positioned at right angles.

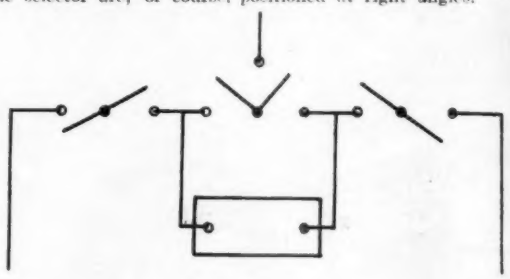


Fig. 3.—Arrangement of Connections.

The oil breaker, which acts independently of the consumer's connection, by virtue of the fact that it is not required to operate on fault conditions, is designed with a comparatively low rupturing capacity. It is not automatic.

The cubicle is arranged in two compartments, one containing the complete selector unit, and the other the circuit breaker and cable-end boxes. Suitable doors serve both the upper and lower portions of the cabinet. The bottom doors hook on to escutcheons and cannot be removed whilst the oil breaker is in the closed position; the breaker handle extends through the doors. In their closed position the top doors fix the bottom ones and also prevent operation of the oil breaker, suitable interlocking being arranged for these doors and the breaker handle. The circuit breaker is slung in an angle-iron cradle and can be easily removed.

With the "Metesco" apparatus many useful schemes can be drawn up, other than the simple one-load control. For instance, by coupling a number of the units through their

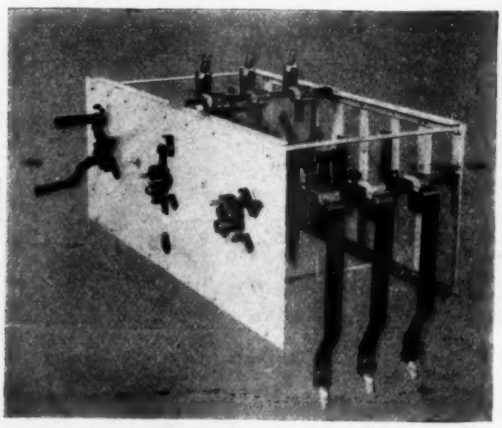


Fig. 4.—Selector Unit.

selector switches various interconnecting cables can be introduced.

The apparatus, for the purpose of manufacture, is in the hands of Messrs. Long & Crawford, Ltd., who have brought about a number of improvements during its development.

We understand that Mr. Harmer is indebted to his company and colleagues for many helpful suggestions and testing facilities. A further piece of apparatus to Mr. Harmer's design is being evolved for the protection of the transformer. This takes the form of an oil-fuse isolator and is in the hands of the Yorkshire Switchgear & Engineering Co., Ltd., for manufacture.

We are indebted to the *Electrical Power Engineer* for the above illustrations and information.

New Rectifying Apparatus.

The Westinghouse Brake & Saxby Signal Co., Ltd., has developed a range of small current rectifying apparatus incorporating a new metal-oxide rectifier.

A NEW metal rectifier and its applications to radio, signalling and battery charging, were the subjects of a Press visit recently to the Chippenham works of the Westinghouse Brake & Saxby Signal Co., Ltd. The rectifier has been developed by the company to meet the demand for a small, efficient and compact apparatus primarily for battery charging on the "trickle" principle, but it has many other possible applications and has been embodied in a range of battery-charging units for garage and radio work, and the like, and also in apparatus for railway signalling, high-resistance fault detection, and so on. The rectifier proper operates on the same principle as that of the apparatus described by Prof. H. H. Sheldon, Ph.D., of the New York University, in the *Scientific American* (ELECTRICAL REVIEW, November 12th, 1926, p. 813). It depends for its action on the fact that the ratio of the resistance from copper to an oxide coating to that from the oxide to the copper is very high—of the order of 1,000. Essentially the simple rectifier consists of a copper plate or washer with one surface oxidised, suitably assembled as a unit with the necessary leads in and out for the current, and clamping, insulating and cooling arrangements. The construction of the apparatus is shown in fig. 1. The lead plate in immediate contact with the oxide ensures an even distribution of the current over the contact surface. The units are connected in series or parallel, according to the voltage or current output requirements, and arranged in the Gratz formation, as shown in fig. 2.

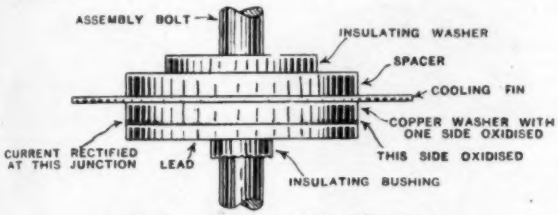


Fig. 1.—Construction of Metal Rectifier.

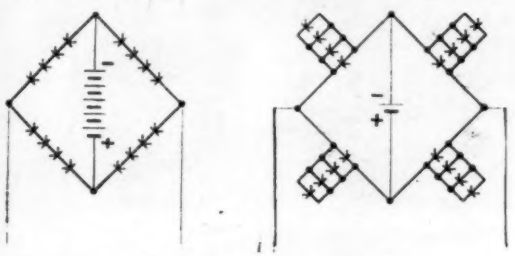


Fig. 2.—Formations of Rectifier Units.

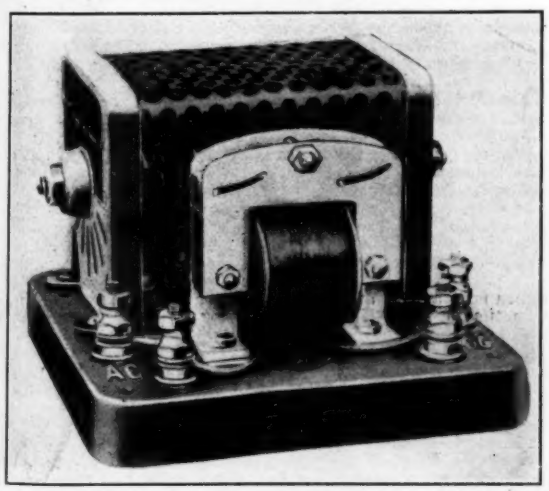


Fig. 3.—"Trickle" Charging Set, with Adjustable Reactor.

Efficiencies of about 60 per cent. are claimed for this type of rectifier, as compared with figures ranging from 3.6 to 43 per cent. given as test results from electrolytic, thermionic and vibrating equipment. An important claim for the Westinghouse rectifier is that it maintains its efficiency over a wide range of temperature.

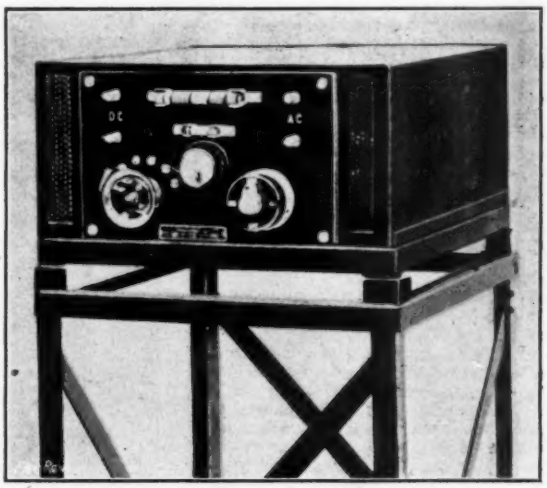


Fig. 4.—Large Battery Rectifier Set.

As already indicated the principal application of the new equipment, as developed so far, is in connection with battery charging, and the following are some selections from the range of apparatus developed for this purpose. Fig. 3 shows one of a number of rectifier sets designed for "trickle" charging track or line batteries. The input voltages of these sets vary from 5 to 240, giving on the d.c. side pressure and current ranges of from 2 to 12 V and 0.1 to 1.0 A. The outfit illustrated is provided with an adjustable reactor for regulating the charging current, but others include a reactive transformer, as a means of obtaining the correct charging pressure, in addition to arrangements for adjusting the current. Larger units have been designed for dealing with larger stand-by batteries, and are capable of giving an output of 3 A at 110 V. Metal rectifier sets designed for outputs in the neighbourhood of 1 A at 1,500 V have also been successfully operated, and it may be safely said that the production of apparatus suitable for dealing with greater outputs at this pressure is only a matter of workshop development. Sets made up for wall mounting include a switch and fuse in one pole of both the a.c. and d.c. circuits, as well as an ammeter for covering the

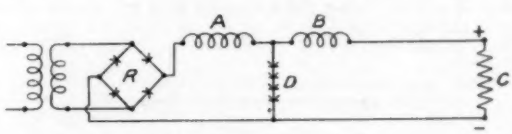


Fig. 5.—Smoothing-Out Circuit.

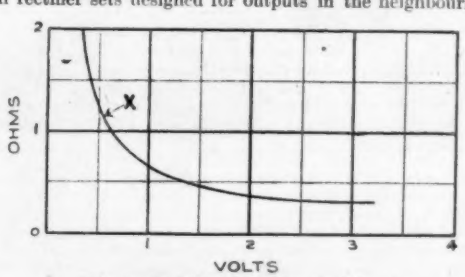


Fig. 6.—Low-Resistance Characteristic.

charging range; these are suitable for pressures up to 600 V, a.c.

An interesting outfit for charging fairly large batteries is shown in fig. 4. This also can be used on a.c. pressures up to 600 V, with output loadings ranging from 0.3 to 6.0 A at from 114 to 55 V. A transformer and tapped reactance are housed in the casing of this model, the connections from the reactor taps being brought to a 6-way switch for regulating the charging current.

The Ferranti "trickle" charger (ELECTRICAL REVIEW, September 30th, 1927, p. 540) is another interesting development of the new apparatus for radio work. It embodies a rectifier with an output capacity of 0.5 A connected to a step-down transformer, the whole being enclosed in a sheet-metal case.

Typical examples of how rectifiers without batteries may be used to operate efficient d.c. apparatus from a.c. supplies are shown in the instruments where high-resistance d.c. voltmeters are used to measure low a.c. pressures, small rectifying units being used between the a.c. supplies and the instruments. In this connection a rail-current meter has been developed for measuring small alternating currents superimposed on the rails for signalling purposes.

A particularly important characteristic of the metal rectifier is that which enables the apparatus to be used as a means of smoothing out pulsating currents when used in conjunction with inductances. In fig. 5 the metal rectifier R supplies a pulsating wave through the inductances A and B to load C. The bank of rectifier units D is so designed that each disk has a mean d.c. voltage equal to point X on the forward or low-resistance curve, fig. 6. When the pulsating pressure rises above the mean d.c. voltage the decreased resistance of D results in the increased output, being shunted across to the negative pole. The inductances serve to fill up the spaces between the unidirectional pulsations by virtue of their stored energy.

A further application of the apparatus is in connection with leakage indication. Apparatus designed for this purpose has a unit containing two transformers, two small rectifiers, two d.c. relays and a lamp indicator. The transformers have their primary windings connected in series across the a.c. bus-bars, the centre connection between the two windings being earthed. The secondary windings form the input to the rectifiers, the outputs of which are taken to the two relays. As long as the a.c. system is balanced to earth the relays remain energised. When an earth leakage occurs on one pole the result is a lowering of the voltage on the corresponding relay which operates and lights a warning lamp. Similar indication is arranged for the opposite pole and also for normal conditions.

Among the other applications of the metal rectifier are polarised control, using the apparatus as a non-return valve, and small-alternator excitation, a rectifier fed from the alternator windings taking the place of the rotary exciter.

A Small Bulk-Supply Scheme.

The electricity undertaking at Richmond, Yorkshire, which was started in October, 1926, and now has 200 consumers.

RICHMOND, a town of about 4,000 inhabitants in the N. Riding of Yorkshire, is some considerable distance from any public electricity supply area, but an overhead line from the War Office generating station at Catterick passes within about 1½ miles of the town, and arrangements have been made for the Corporation to take a bulk supply from this source.

The line is tapped at a point about 2,500 yards from the town boundary, and a new line runs from this point to the bank on the town side of the River Swale. The line pressure is 3,000 V, 3-phase, and consists of .05 sq. in. section stranded-copper conductors, with a 7/16 s.w.g. galvanised-steel stranded earth wire. Single wood poles, 36 and 40 ft. long, are used, except at the river crossing and the junction with the W.O. line, where H poles are installed. The average span is 200 ft., the river crossing being 200 ft.

From the terminal pole on the town side of the river bank to the sub-station, a distance of about 400 yards, a three-core .0225-sq. in. cable, p.i., l.c., is run, being laid direct in the ground. At full load the voltage drop between the generating station busbars and the sub-station is under 6 per cent.

A conveniently situated building near the Market Place was acquired and reconstructed for use as a sub-station. The sub-station proper, fig. 1, is on the ground floor, the first floor, reached by an outside staircase, providing accommodation for the engineers and office staff, together with a meter-testing room and an inquiry office.

The h.p. switchgear is of the simplest possible nature. Three sheet-steel cubicles, each fitted with three isolating switches, are installed. The feeder cubicle has a cable box and current and potential transformers for the three single-phase watt-hour meters. The transformer cubicles have isolating switches only. The isolating switches can be used to break the small no-load current of the transformers, since this has only seldom to be done. Connections from the cubicles to the h.p. side of the transformers consist of single-core rubber-insulated and lead-sheathed cables.

Two 3-phase transformers are installed, each of 93.75-kVA capacity, ratio 2,900/400-230 volts. They are of the core type, oil immersed and self-cooled, delta-star connected, and have plus and minus 2½- and 5-per cent. tappings on the h.p. side brought to terminal boards at the oil level. The neutral point is brought out for the lighting supply, phase to neutral.

The l.p. switchboard is of the totally enclosed ironclad type, occupying less space than a flat-back board and costing no more. Totally enclosed four-pole isolating switches are provided between the busbars and the oil switches, and the design includes a complete system of interlocks. Each circuit has time-limit overload protection. The two feeder circuits are each fitted with a watt-hour-meter, an ammeter switch to enable ammeter readings to be taken on any phase, and a time switch and s.p. switch-fuse to control the public lighting.

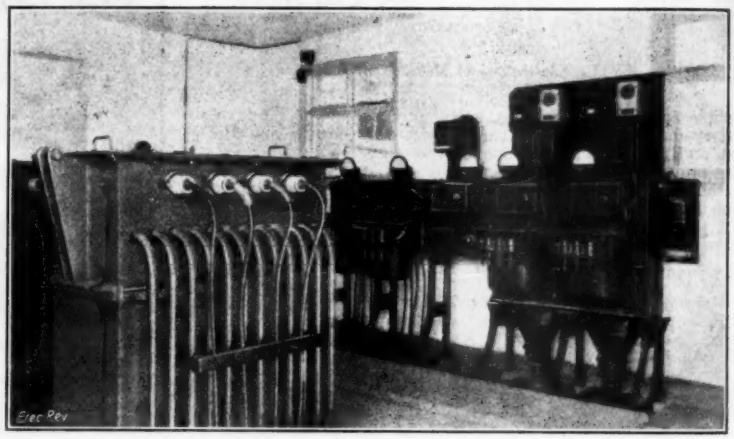


Fig. 1.—Bulk-Supply Sub-station, Richmond, Yorks.

Between the transformer and feeder panels is a chamber housing current transformers for operating a recording unbalanced, 3-phase, 4-wire wattmeter, installed to enable load curves to be obtained, as the sub-station is not attended.

Two main feeders form a ring main round the Market Place and principal streets. The cables are paper insulated, lead covered, and steel-tape armoured, and are laid direct in the ground except in a few places. The ring is joined across in two places by smaller feeders, which can be disconnected when necessary. A number of other feeders tap off the ring at various points.

For sectionalising purposes underground disconnecting boxes are used. Four cast-iron distribution kiosks are installed; these are equipped with porcelain handle fuses mounted on micanite-insulated steel rods. The service cables are twin 7/.029 or 7/.036 in., paper insulated, lead covered, and steel-tape armoured.

Electric street lighting has been adopted for all the important streets, and the clock tower of the old Trinity Church is also illuminated. The lighting is arranged on two circuits, providing 26 "all-night" police lights and 41 "evening" lights. The "evening" lights are divided into three groups, each group being switched on by a time switch at a predetermined hour and off at 11 p.m. Each "all-night" light has its own time switch.

Existing gas standards have been utilised by means of adaptable fittings supplied by the Electric Street Lighting Apparatus Co., Ltd. Some standards and lanterns have been modified, and others have been fitted with new lanterns. In some places double-bracket fittings have been clamped to road direction posts. In general the "evening" lights are each fitted with one 40- or 60-watt lamp, and the "all-night" lights with a 100-watt lamp. The supply was started in October last year, and up to August 31st last 48 000 units had been sold, with a maximum load of 30 kW. There are to date 200 consumers, including 31 h.p. of motor load. The charges are 8d. per kWh for lighting and 4d. for power. A hire-purchase wiring scheme is under consideration.

The scheme was prepared by Mr. A. P. Pyne, M.I.E.E., consulting engineer to the Corporation. The whole of the plant, except the street-lighting fittings, was supplied by Messrs. Johnson & Phillips, Ltd., who also erected the overhead line, laid the cables, and erected the distribution equipment.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

Bakelite Lampholders.

So rapidly is the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, pursuing the policy of extending its wide range of "Magnet" bakelite all-insulated accessories for electric lighting, that it is becoming a habit to look for a new product almost every week. Recent productions are two new lampholders. Fig. 1 shows a screw-on type of lampholder, which is in course of manufacture

Fig. 1.—Screw-On Holder.

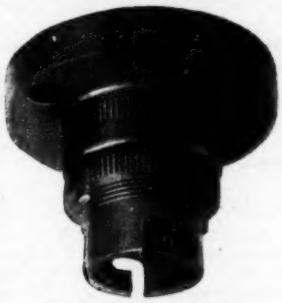


Fig. 2.—Backplate Holder.

with a complete range of threads, *viz.*, ½ in.-⅝ in. brass, ⅜ in-¼ in. electric, ½ in. gas. The second, fig. 2, is a backplate type of lampholder with two fixing holes at 2 in. centres, and is eminently suitable for direct surface fixing with surface wiring systems, for block mounting, or for mounting on British standard conduit boxes. These lampholders can be supplied with H.O. type insulating shields. A further addition to the company's bakelite products is a neat quick-make and -break suspension switch.

An Electric Hot-water Radiator.

What is claimed to be an efficient electric hot-water radiator is the "Oatway" auto radiator, fig. 3, which has recently been introduced by Messrs. S. B. SMITH & CO., LTD., 14, Savoy Street, Strand, London, W.C.2. The water-containing portion is of cellular construction, and resembles very closely the ordinary motor-car radiator. It is effectively utilised to create a definite air circulation and to give a large heat-discharging surface in relation to its compact size, *i.e.*, 18½ sq ft. radiating surface for a radiator 16¼ in. by 10½ in. by 3 in. Further, the inventors have been successful in giving to the radiator the "glowing fire" appearance, the lack of which is usually a point of criticism with the ordinary type of electrical hot-water radiator. The "Oatway" is claimed to have all the thermal advantages which are well recognised as attaching to self-contained electrical hot-water radiators of the best type, *i.e.*, absolute safety, high efficiency, freedom from fumes, and so on, and, in addition, it possesses the important feature that its low water content and large radiating surface result in it quickly coming to and circulating full heat without any of the troubles and disadvantages associated with open-element radiators. The apparatus can be made either portable or fixed. It is constructed throughout of brass and is made in a variety of finishes. The radiator can be supplied in a number of sizes with loadings varying from 250 to 3,000 W and for the usual working pressures. The dimensions given above are for the 500-W size, which has a water capacity of 5½ pints. It is equipped with a regulated immersion heater, which, with the large heat-radiating surface, renders, it is claimed, it impossible for the water to boil. The gills are set at an angle, and as the water heats it automatically circulates continuously through these, which throw off the heat. A vacuum is caused in each gill; thus by convection the air is continuously drawn through them and thrown up into the room, causing a continuous circulation of warm air. The "Oatway" was exhibited for the first time at the recent Shipping, Engineering and Machinery Exhibition at Olympia.

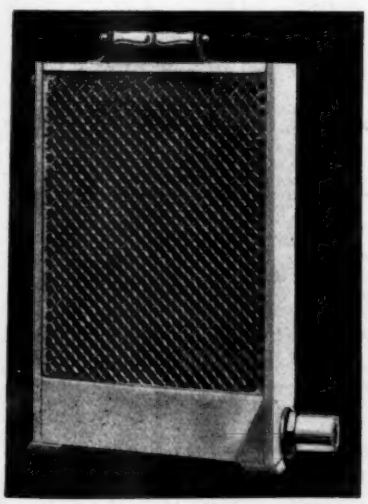


Fig. 3.—The "Oatway" Auto Radiator.

An Improved Air Filter.

The standard "Visco" air filter, widely used in connection with turbo-alternators and the like, has an efficiency of about 98 per cent. as regards dust, which is quite satisfactory for general ventilation, but it does not perhaps meet the stringent

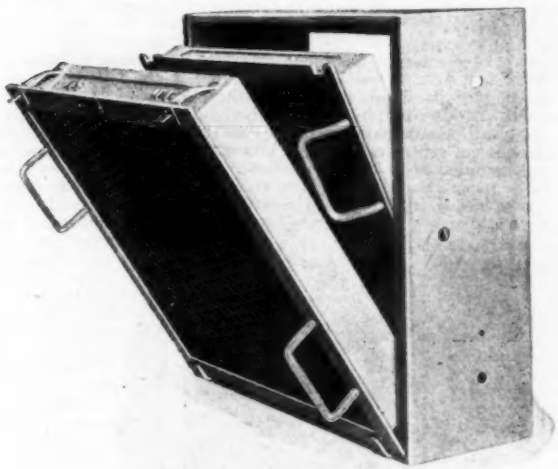


Fig. 4.—The "Super" Air Filter.

requirements of operation for theatres, breweries, and various industries, particularly if it is desired, not only to remove the dust, but also to remove and destroy air-borne bacteria. The VISCO ENGINEERING CO., LTD., 162, Grosvenor Road, London, S.W.1, has therefore developed the "Super" filter, fig. 4, which consists of a sheet-metal box-shaped frame, in which are placed two removable filter cells arranged in series; both cells are constructed entirely of metal and filled with "Visco" filter rings. The front cell is exactly of the same design as the standard filter, but the second cell contains filter rings of a much finer grade. Special precautions have been taken to prevent any air by-passing during operation by means of a felt joint between the secondary cell and the frame, and in addition automatic louvres can be fitted, which close as soon as the front cell is removed for cleaning purposes. The filtering medium in both cells is covered with a thin film of "Viscinol," or, if it is desired to also destroy the bacteria collected, with germicidal "Viscinol," both of which have neither taste nor smell. The "Super" filter has an efficiency of practically 100 per cent., both as regards dust and bacteria. The filter cells are cleaned by immersion in hot soda-water, after which they are re-dipped in the viscous preparation. While this may be necessary for

Fig. 5.—The "Wylex" Switch-Plug, Dismembled.

the front cell every six to ten weeks, the secondary cell quite naturally can remain in operation over a much longer period, as it has to deal with very small quantities of impurities only. The super filter can, it is claimed, easily be arranged in combination with heating, cooling, drying or humidifying apparatus and fitted with automatic control gear, to produce the most ideal air conditions in any locality. The illustration shows the air inlet side of the apparatus.

A Novel Switch-Plug.

We have received from MESSRS. GEORGE H. SCHOLES & CO., LTD., Blantyre Street, Hulme, Manchester, a sample of their latest production, the "Wylex" 3-pin switch-plug. It is of the all-insulated type in bakelite material with a high finish. While it retains the simple push-and-pull feature of the ordinary plug, a quick-make and break are given to the contacts by virtue of the enlarged cone-shaped end of the centre or earthing contact which, during insertion or withdrawal, passes between and displaces two spring-controlled balls in the walls of the central guide on the base; the self-replacement of the balls imparts a final "kick" to the contact, in or out. The plug is of robust construction and easy access is arranged for all the terminals. All the contacts, both plug and socket, are arranged with their respective terminals as one-piece units. The movable or "plug" contacts make external connection with the base contacts. A useful feature is an automatic spring-controlled shutter on the cover, which effectively closes the apertures on the withdrawal of the plug. The device is suitable for 15-25 A loading and can be supplied in three patterns, surface and sunk insulated, or ironclad. Fig. 5 shows the construction of the various parts of the device.

An Automatic Switch.

We have received from THE DRAYTON REGULATOR & INSTRUMENT CO., LTD., West Drayton, Middlesex, the following particulars of its latest production, the "Drayton" automatic quick-break switch, fig. 6. The mechanism has been specially designed for automatic operation, and is based on the familiar spring-over centre principle. The contact and operating levers are mounted on a common fulcrum pin, enabling the switch to be made in a very compact form, while the contact is positively locked in the closed position. The locking catch has been sufficiently tensioned to ensure a sharp clean break. A

Fig. 6.—The "Drayton" Automatic Switch.

permanent blow-out magnet is fitted, which helps to prevent arcing. The switch is supplied as an automatic pressure regulator by the provision of a seamless metal bellows to receive the pressure impulse, the operating pressure being adjustable by means of a spring, opposing the action of the bellows. For temperature control, the operating impulse is obtained from the pressure of a volatile liquid contained in the bulb, which is connected to the bellows by means of capillary tubing. The switch is capable of breaking 10 A at 220 V, and is supplied in s.p. and d.p. forms. It is suitable for the direct control of small motors without the interposition of an automatic motor starter. The switches, having no delicate parts such as glass tubes containing mercury, are particularly robust.

An Electric Piano Heater.

An addition to the range of "Inventum" electrical appliances is a piano heater which is being introduced by Mr. ALAN WRIGHT, 124, Chancery Lane, London, W.C.2. It consists of a copper tube containing resistance wire wound on a stretched asbestos cord supported at suitable intervals by reel-type insulators. The tube is slotted for the easy inspection of the element and is suitably mounted for fixing inside the piano. The device is 20 in. long, 2¼ in. wide, and weighs 1 lb. The loading is 60 W.

Electrical Imports of British Malaya.

Comparison of Two Years' Figures.

BELOW are given the values during 1925 and 1926 of the imports of electrical and allied material into British Malaya, together with a note of increase or decrease in the trade:—

	1925.	1926.	Inc. or dec.
Wire and cable, insulated—	$	$	$
Total	1,517,000	1,369,000	−148,000
From United Kingdom ...	1,486,000	1,233,000	−253,000
,, Japan	5,500	5,500	—
,, United States ...	2,000	8,000	+ 6,000
Telegraph and telephone instruments and apparatus—			
Total	246,000	538,000	+292,000
From United Kingdom ...	229,000	517,000	+288,000
,, United States ...	5,000	6,000	+ 1,000
,, Continent of Europe	—	9,000	+ 9,000
Electric lamps and parts—			
Total	86,000	48,500	− 37,500
From United Kingdom ...	26,000	29,000	+ 3,000
,, Continent of Europe	34,000	14,600	− 19,400
Electric lamp bulbs—			
Total	261,000	440,000	+179,000
From United Kingdom ...	90,000	235,000	+145,000
,, Continent of Europe	94,000	83,000	− 11,000
,, United States ...	22,000	39,000	+ 17,000
,, Japan	18,000	34,000	+ 16,000
Batteries and accumulators—			
Total	181,000	357,000	+176,000
From United Kingdom ...	55,000	76,000	+ 21,000
,, Japan	36,000	24,500	− 11,500
,, United States ...	83,000	176,000	+ 93,000
Electric lighting accessories and fittings—			
Total	177,000	181,000	+ 4,000
From United Kingdom ...	110,000	101,000	− 9,000
,, Continent of Europe	24,000	28,000	+ 4,000
,, Japan	36,000	36,000	—
,, United States ...	83,000	5,800	− 77,500
Electrical goods and apparatus (not machinery) not elsewhere mentioned—			
Total	843,000	1,294,000	+451,000
From United Kingdom ...	565,000	707,000	+142,000
,, Continent of Europe	82,000	184,000	+102,000
,, United States ...	140,000	293,000	+153,000
Electric generators—			
Total	43,000	108,000	+ 65,000
From United Kingdom ...	34,000	78,000	+ 44,000
,, Continent of Europe	1,400	21,600	+ 20,200
,, United States ...	6,000	3,200	− 2,800
Motors—			
Total	240,000	409,000	+169,000
From United Kingdom ...	150,000	338,000	+188,000
,, Continent of Europe	1,400	28,600	+ 27,200
,, United States ...	18,000	30,000	+ 12,000
Ignition magnetos—			
Total	22,000	40,000	+ 18,000
From United Kingdom ...	6,000	12,000	+ 6,000
,, Continent of Europe	54,000	20,000	− 34,000
,, United States ...	7,000	6,800	− 200
Other Electrical machinery—			
Total	1,055,000	1,373,000	+318,000
From United Kingdom ...	804,000	1,180,000	+376,000
,, Continent of Europe	8,000	91,000	+ 83,000
,, United States ...	57,000	80,000	+ 23,000

A Rivetless Steel Railway Bridge.

An arc-welded, rivetless, steel railroad bridge, said to be the first of its type, is to be erected on the line of the Boston and Maine Railroad at Chicopee Falls, Mass. U.S.A., according to Mr. Gilbert D. Fish, consulting structural engineer for the Westinghouse Electric and Manufacturing Co. Only 80 tons of steel would be needed for the welded job, said Mr. Fish, whereas 120 tons would be necessary if the job were riveted. The bridge, which will be 175 ft. long, is expected to be finished by January 1st. Exhaustive tests on arc-welded joints conducted by the Westinghouse Co. had advanced the process beyond the experimental stage, Mr. Fish stated. Several buildings have been erected in which arc-welding has been used to join the steel framework.—*Reuter's Trade Service* (New York).

Public Electricity Supply.

Some Comments on the Use of Overhead Transmission Lines and the Development of Hydro-Electric Power in Scotland.

By D. MACFARLANE MACLEOD, M.I.E.E.

(*Extracts from Chairman's Address at the* SCOTTISH CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

A BRIEF review of the whole position may serve some useful purpose by, first, disabusing the mind of the pessimist, and, secondly, correcting the roseate view of the optimist.

Overhead Transmission Lines.

The findings of the Coal Conservation Sub-Committee of the Reconstruction Committee and of the Electric Power Supply Committee, confirmed the unsatisfactory legal and engineering position of the electricity supply industry. The latter Committee's recommendations relating to overhead lines and wayleaves in 1918, which include such expressions of opinion as "The future development of electricity in many districts will depend largely upon facilities being granted for the use of overhead lines, and it is of vital importance that restrictions which exist at the present time should be removed, or amended. It will not only tend to cheapen the supply to consumers in industrial districts, but will also be an important factor in developing the use of electricity for agricultural purposes. . . ." are an indictment of the legislative restrictions that hamper development by means of overhead transmission lines, but they do not include all the vexatious and restrictive provisions that encumber procedure, and it seems a pity that so many still call for redress.

Vested in the Electricity Commissioners and the Minister of Transport is the unification and control of an industry greatly in need of unification. It may yet prove that the delay in standardising systems of generation and distribution is not a disadvantage. Nothing is to be gained by standardising mediocrity, and I believe we have been saved from that misfortune. The hard school of experience has taught undertakers to discard many systems and types of plant, but now well-defined standards and types have been reached, and they are generally accepted alike by users and manufacturers.

The Central Electricity Board's proposal to use a working pressure of 132,000 volts for the main transmission lines is a radical departure from existing practice in this country. At present no line in this country is in regular operation at a higher pressure than 60,000 volts, and the Commissioners' proposals have doubtless been influenced by the success of super-voltage lines abroad. Hitherto our cable manufacturers have been able to keep pace with the requirements of our home transmission schemes, but this new departure leaves them far behind. The transmission system of the Central Scotland Scheme* extends over a route length of 228 miles. *Apropos* of the use of super-voltage cables, there is an interesting note in the supplementary particulars of the South-East England Scheme†, which is as follows:—

> "Careful inquiries have been made as to the use of existing 66,000-volt single-core cables in Paris, and of 132,000-volt single-core cables laid by the Commonwealth Edison Company at Chicago and elsewhere, as the employment of higher-voltage cables for certain of the main interconnecting lines within the London area would effect a considerable reduction in the estimated cost of the Board's transmission system. The further experience which will be gained between the present date and the time when the Board will issue its specifications for certain of these lines will, it is hoped, enable the Board without undue risk to adopt a higher-voltage cable system."

The Electricity (Supply) Act, 1922, postulates great national development of our trunk distribution system by means of overhead transmission lines, but, if progress is to be made, the whole procedure governing the erection of transmission lines stands in need of drastic revision. The suggestion contained in the Williamson Report that the Electricity Commissioners should be granted power to authorise the placing of lines over, under, or across, any private land, and that compensation should be assessed by arbitration after the work has been done, is thoroughly sound. It is intolerable, for example, that a landowner should put the interests of his shooting tenant before those of the State.

The right at present enjoyed by the Minister of Transport to review the permission to erect an overhead line after five years surely marks the negation of all progressive development; again, the right claimed by the Post Office authorities, when they are second comers on the ground, to exact a payment from an undertaking is surely most inequitable. What other industry comes under such an anomalous condition? Has not the time arrived when the Commissioners might approve of typical constructional plans for transmission lines up to, say, 33,000 volts? This would save the time of undertakers in waiting for consideration and approval of every line notified, a procedure which would only be justified if the methods of construction were novel or unfamiliar. It is to be hoped that the operations of the Central Electricity Board will hasten the removal of such obstacles.

Scottish Water Power.

It is interesting to note that the two hydro-electric stations "selected" for the Central Scotland Scheme form part of the potential power dealt with in the Water Power Resources Committee's report published in 1921, and that the plant in these stations is on the eve of completion. The Falls of Clyde hydro-electric scheme is the largest in this country of its kind to be devoted to public electricity supply, and the output of the combined plant, which consists of two sets in each station, is 15,520 kW, which is fed direct into the Clyde Valley Electric Power Company's 11,000-volt network through booster transformers and overhead transmission lines. The cost of the hydro-electric generating equipment, including the purchase price of land and water rights, buildings and plant, is about £27 per kW of installed plant.

The transmission lines have been carried across several private estates under wayleaves negotiated with the proprietors, and it is a tribute to their broad and enlightened outlook that they have given every facilty, not only for the erection of the lines upon their designed routes, but also for the cutting down of growing timber that threatened the continuity of supply. In the few isolated cases in which trouble was experienced when arranging wayleaves, the difficulties yielded to friendly negotiations without recourse to the cumbersome procedure prescribed in the Electricity (Supply) Acts, a procedure, I may add, which not only puts a premium on obstruction, but also causes vexatious delay and expense.

This scheme is amongst the first of the surveyed projects to be translated into practical application, and gives fair promise of yielding the results expected. When one reflects that bathymetrical surveys of our Scottish Lochs have been carried out in great detail by competent engineers, there is every reason to believe that the calculated results published in the final report of the Water Power Resources Committee can be secured if and when the schemes are put in hand. There is in Britain the equivalent of 270,000 kW of continuous output, of which about 200,000 kW is available in Scotland, and I would like to enter a plea for the fuller utilisation of Scottish water power. The Board alone has the requisite authority to build transmission lines, irrespective of all geographical boundaries, and to extend supplies to districts hitherto outwith the reach of present development.

One of the great hindrances to the adaptation of water-power schemes to public electricity supply purposes has been the necessity for providing against drought conditions by the erection of storage dams, or the provision of standby plant, but the erection of a national system of transmission lines will materially alter the conditions in favour of water-power development. The development of Scottish resources is, I think, the key to the revival of our highlands by stimulating agriculture and industry. For years the depopulation of these parts has been going on unchecked, there being no future for young people save migration to the towns, or to the colonies. Large tracts of land are lying water-logged and sour, and much of the arable land is of poor quality, yielding only the barest subsistence as a return for arduous toil in its cultivation. Much has been done abroad, notably in Denmark, for the reclamation of heath lands, and if electric power were available it would greatly facilitate this work, in addition to stimulating highland industries.

*ELEC. REV., May 13th, 1927.
†ELEC. REV., October 7th, 1927.

Are Gas Works Obsolescent?

Referring in its monthly Bulletin to a scheme of the Bingley Gas Committee to reconstruct the gasworks at an estimated cost of £100,000, the executive of the Bingley Chamber of Trade makes the following observations:—"The executive has considered this proposal most carefully, and in view of the rapid progress in consumption and production of electricity and the certainty that, within a few years, it will entirely have superseded gas as an illuminant and for power purposes if not also for heating and cooking; also, in view of the fact that such capital expenditure as proposed must for a long period increase the cost of gas very considerably, they feel that the Urban District Council would be well advised to postpone consideration of any such scheme for ten years at least."

The Overhead Lines Association.

A Discussion on "Wayleaves."

A WELL-ATTENDED meeting of the Overhead Lines Association was held at the Royal Society of Arts, London, on Wednesday, November 2nd, Mr. R. Borlase Matthews occupying the chair.

In the course of a discussion as to the scope of the Association, the following definition was generally approved :—

The objects of the Association are to further the interests of users of overhead lines by collecting and circulating information on the design, cost, and maintenance of overhead lines; to consider rules and regulations that govern the erection of overhead lines, and their relation to other authorised undertakings; to facilitate wayleaves and the granting of reasonable powers for the compulsory acquisition of the same, the aim being to make available with reasonable promptness, in every home in Great Britain, an abundant supply of electricity, and generally, to adopt any course of action that the members may consider beneficial in connection with the use of overhead lines.

On the question of subscriptions, various suggestions were made varying from one guinea to two guineas with an entrance fee. These views will be considered by a special sub-committee and recommendations will be made for the approval of the members later. Incidentally, it was suggested that as the Association would be of considerable use in removing difficulties and delays in the erection of overhead lines, all of which would be to the advantage of the supply authorities that the various members served, those authorities might reasonably be expected to contribute to the funds of the Association.

With regard to the grades of membership, the general idea was that there should be members, associate members, and subscribers. The qualifications suggested for full membership were that only those engineers in charge of the erection and maintenance of overhead lines should be full "members," that those interested in overhead lines, but not in charge of operation or maintenance (for example, consulting engineers and others), should be "associate members," and that "subscribers" should be manufacturing firms, supply companies, and municipalities. These suggestions will also come before the sub-committee. Thus the control of the Association will be in the hands of the supply engineers themselves.

In closing the general discussion on these matters of domestic policy, the Chairman stressed the point once more that the sole object of the Association was to assist in every possible way in removing the difficulties and drawbacks which were experienced by those wishing to erect overhead lines, and to be in no way antagonistic to existing organisations or authorities.

Members, or intending members, are asked to send any further suggestions to the honorary secretary of the Association, Mr. Theodore Stevens, 50, Lincoln's Inn Fields, London, W.C.2.

Wayleaves.

A discussion then took place upon wayleaves.

Mr. W. C. Bexon (Ayrshire Electricity Board) in a comprehensive review of the present position and difficulties, which largely covered the ground he traversed in his I.M.E.A. paper at Buxton last May (Electrical Review, p. 900), made the following suggestions :—

(1) That a simple wayleave agreement should be adopted. According to the Electricity Supply Acts, in obtaining wayleaves the undertakers must deal with both landlord and tenant, and that introduced a difficulty which he had endeavoured to overcome in a wayleave agreement which he had drawn up.

(2) That a standard wayleave rental should be adopted, and this, whatever figure were arrived at, should cover both landlord and tenant—*i.e.*, the landlord would receive the sum but he would compensate the tenant.

(3) That in the case of arbitration, the arbitrator should be local and nominated by the Electricity Commissioners or the Ministry of Transport. It seemed extraordinary that representatives from London should have to go right up to Scotland for the purpose of hearing a simple case as to the amount of damages to be assessed due to the erection of a few poles—it might even be only one pole, because the lack of one pole could prevent the completion of an overhead transmission line.

(4) That as far as low-pressure distribution was concerned, a meeting should be held with the Post Office to press for a relaxation of its Regulations. With regard to high-pressure lines, cradling should be scrapped, and the distance between the telegraph lines and the power lines should be reduced. If low-pressure lines could be run on the same poles as the telegraphs in other countries, why could not they do the same here? He believed the Association could devise some method which would give the Post Office ample protection.

(5) That the Association should meet the railway authorities, because the railway companies were large users of electricity and it was in their interests that everything should be done to minimise costs.

(6) That a frank discussion should take place with the Electricity Commissioners and the Central Electricity Board, with a view to insisting on a further Electricity Supply Act giving compulsory powers to erect power lines.

Continuing, Mr. Bexon said that the Central Electricity Board had issued specifications for the erection of overhead transmission lines in Scotland, but these lines could not be erected under present conditions if a person took up the definite attitude that he would not allow lines to cross his property. The proper development of overhead distribution must mean that lines would have to go over gardens or buildings, but under the Electricity Supply Act of 1919 this could not be done without permission, and the Minister of Transport could not give compulsory wayleaves. Finally he expressed the view that electricity supply was more important than telegraphs and telephones and should at least have equal facilities.

Mr. A. Lennox Stanton suggested that the first task of the Association should be to aid the Electricity Commissioners to produce model wayleave forms covering all cases and designed to admit of uniformity of application throughout the country. The Association should also submit recommendations to the Commissioners which would provide for a simplification of procedure, reduce delays, and eliminate unnecessary expense. Finally, the Association should endeavour to secure such cancellations, revisions, or amendments in the statutory position as might be proved necessary for the proper development of electricity, and focus public attention upon all the obstacles to progressive effort represented by the wayleave question.

The Chairman mentioned that the hon. secretary had prepared an analysis of seventeen wayleave forms which had been sent to him; copies would be made available. He expressed the hope that other wayleave forms would be sent in.

Mr. W. T. Taylor urged the adoption of the policy in this country which applied almost universally in other countries—that public utility undertakings should have what was known as "the right of eminent domain." In other words, the rights of individuals had to give way to the considerations of public good and common welfare, the question, of course, to be decided by an appropriate authority, for instance, the Minister of Transport in the case of overhead transmission lines.

Mr. Theodore Rich said that 25 years ago, Italy, France, and Switzerland were in exactly the same position as regarded overhead lines as we were in this country to-day. Expensive protection had to be put up by the electricity supply people for telegraph and telephone lines, and also when crossing railways, but the result of experience had changed all that. A doubled insulator and a certain limited tension on the wire were usually sufficient now when crossing telegraph and telephone lines; the cost of some such crossings to-day was under £10. Difficulties with the telegraph and telephone authorities were dealt with in France by a Comité Electrique—a voluntary body consisting of representatives of all concerned—which had been in existence since 1906, and there was no difficulty in settling any question that arose. It had been laid down by the Government that the most important amenity in any particular case must have preference.

Mr. W. Fennell remarked that the whole trouble was deep down in the British constitution, in that there was a tremendous respect for ownership of land in this country. His practical suggestion was to see that the Electricity Supply Act of 1919 was put into force as, apparently, it was intended to be. According to Section 22 of that Act, if a landowner did not agree to poles being placed on his land, after 21 days' notice, the Board of Trade could be asked to arbitrate. In practice, the supply authorities went on negotiating for months and years, and often nothing was done. Although hitherto he had not met many difficulties—he had constructed 25 miles of 33,000-volt overhead lines and 25 to 30 miles of branch lines during the past three or four years—he proposed in future to insist upon the Act being applied literally. In other words, if a landowner or a local authority did not give consent after the required notice, he would apply to the Electricity Commissioners to take the action provided for under the Act. Already in the case of two local authorities, respecting which he had applied to the Commissioners, the opposition had been withdrawn after what he could only assume was a straight letter from the Commissioners. His sole object was to bring home to the Commissioners the necessity for amending the present legislation.

The Chairman thought Mr. Fennell had struck the right note, because it was only by worrying the authorities that they would be led to take action.

Mr. Bexon, in the course of a brief reply to the discussion, suggested that some sympathy should be shown for the Electricity Commissioners, and that it might be better to discuss the matter frankly with them.

We are informed that the next meeting will be held at the Institution of Electrical Engineers, London, on Wednesday, November 30th, at 5 30 p.m., when a discussion on "Regulations" will take place.

Higher Steam Pressures.

The theoretical and practical gains which may be expected from the application to steam turbines of increased pressure over as wide a range as possible, and the effect of high pressure on details of design.

By A. H. LAW, M.I.E.E., and J. P. CHITTENDEN.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IMPROVEMENTS which have been introduced in power-station operation other than an abnormal increase in initial steam pressure may be tabulated as follows:—

(*a*) Improved vacuum } Within the Rankine
(*b*) Higher steam temperatures } cycle.
(*c*) Regenerative feed-heating } Outside the Rankine
(*d*) Reheating between stages } cycle.

Items (*a*) and (*b*) increase the range of the Rankine cycle, and advances made in station economy by them will be steadily maintained in the future. The vacuum which can be realised under given conditions to-day is very near the maximum theoretically obtainable, so that improvements in this direction must be mainly dependent on local conditions. An initial temperature of 750 deg. F. is now fairly common practice, and in a few cases steam at 800 deg. F. is employed.

Efficiency Due to Higher Pressures.

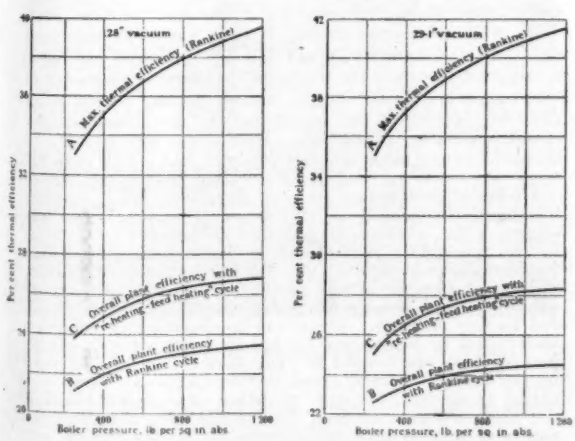
Disregarding for the moment the effect of items (*c*) and (*d*), the maximum theoretical thermal efficiency of a station working on the Rankine cycle is given by dividing the adiabatic heat available by the total heat put into the steam; for superheated steam, a correction is made. Employing a normal pressure of, say, 250 lb. per sq. in. absolute boiler pressure with a total temperature of 750 deg. F., the efficiency when working with a vacuum of 28 in. (such as would be obtained in a power station with a restricted supply of cooling water) is 32.98 per cent., but with a plentiful supply of cold water, and, consequently, a vacuum of, say, 29.1 in., it is 35.42 per cent. These are maximum theoretical efficiencies, and, in order to obtain the actual overall plant efficiency, it is necessary to multiply them by the plant efficiency ratio, which is the result of combining the efficiencies of the steam-generating plant, prime mover, and electrical generating plant, with due allowances for losses in their attendant auxiliaries, and for normal pressures, working under good conditions at 100 per cent. load factor, the ratio would average about 60 per cent. If we assume that figure, then, with cooling towers, the station cannot hope to obtain an overall plant efficiency greater than about 19.8 per cent., and in the case of an unlimited supply of cold water 21.2 per cent. Now, if the pressure be increased to 1,000 lb. per sq. in. absolute, with the same initial temperature of 750 deg. F., the theoretical efficiencies for the two vacua become 38.81 and 40.88 per cent. respectively; assuming the same plant efficiency ratio, the overall plant efficiencies are 23.3 and 24.5 per cent. respectively. These results are summarised in Table I.

Items (*c*) and (*d*) involve a fundamental alteration in the steam cycle, and thus are to be distinguished from improvements (*a*) and (*b*). All the figures given in Table I are based on a plant efficiency ratio of 60 per cent.; the question now to be considered is whether at the higher pressures the efficiencies of the various parts can be maintained. The efficiency factors are almost entirely independent of the steam pressure, but two will be seriously affected thereby: (1) the factor expressing the boiler feed-pump loss, and (2) the turbine efficiency. With the aid of correction curves the overall plant efficiencies given for 250 lb. can be corrected for any desired pressure up to 1,200 lb. per sq. in., and fig. 1 (for 28 in. vacuum) and fig. 2 (for 29.1 in. vacuum) show the theoretical thermal efficiency (curve A) and the overall plant efficiency (curve B); both curves are for a steam temperature of 750 deg. F.

The maximum gain obtainable by increasing the initial pressure from 250 to 1,000 lb. per sq. in. is thus 10.3 per cent.

TABLE I.—OVERALL PLANT EFFICIENCY, ASSUMING 60 PER CENT. PLANT EFFICIENCY RATIO.

Absolute pressure, lb. per square inch.	250 lb.		500 lb.		750 lb.		1,000 lb.	
	Vacuum 28 in.	Vacuum 29·1 in.	Vacuum 28 in.	Vacuum 29·1 in.	Vacuum 28 in.	Vacuum 29·1 in.	Vacuum 28 in.	Vacuum 29·1 in.
Max. thermal efficiency (Rankine)	32·98	35·42	35·97	38·18	37·66	39·75	38·81	40·88
Plant efficiency with Rankine cycle	19·8	21·2	21·6	22·9	22·6	23·8	23·3	24·5
Plant efficiency with 4-stage regenerative feed temperature 250° F	22·2	22·9	23·2	24·8	24·4	26·0	25·2	26·8
Plant efficiency with 1-stage reheating to 750° F	21·1	22·6	23·1	24·5	24·2	25·6	25·0	26·4
Plant efficiency with both regenerative and interheating .	22·4	24·0	24·5	26·2	25·8	27·3	26·6	28·3


28" vacuum
A. Max. thermal efficiency (Rankine)
C. Overall plant efficiency with reheating-feed heating cycle
B. Overall plant efficiency with Rankine cycle
Per cent thermal efficiency
Boiler pressure, lb per sq in abs
29·1" vacuum
A. Max. thermal efficiency (Rankine)
C. Overall plant efficiency with reheating-feed heating cycle
B. Overall plant efficiency with Rankine cycle
Per cent thermal efficiency
Boiler pressure, lb per sq in abs

Figs. 1 and 2.—Rankine Cycle and Overall Efficiency Curves.

The use of reheating under suitable conditions results in a gain from two sources: first, the theoretical efficiency of the cycle itself is increased, and, secondly, the turbine efficiency is improved owing to the wetness loss being diminished. This is, of course, of greater importance at the higher pressures where without reheating a greater portion of the low-pressure stages of the turbine is in the wetness area. Curve C shows that gains of 12.05 and 10.7 per cent. can reasonably be expected for an increase in steam pressure from 250 to 1,000 lb. per sq. in. A feed temperature of 250 deg. F. for all pressures has been assumed in these calculations, but there are many instances of boiler plant having inlet feed temperatures between 300 and 350 deg. F. which have given test efficiencies between 85 and 87 per cent., obtained by the development of the air pre-heater and the suitable use of water-cooled and air-cooled combustion-chamber walls. If now it is assumed that in combination with reheating to 750 deg. F. feed-heating to 350 deg. F. is employed at 1,000 lb. per sq. in. absolute pressure, while still maintaining it at 250 deg. F. at 250 lb. per sq. in. absolute, a further gain of from 2 to 2.5 per cent. on the overall plant efficiency may be expected. In other words, the gain that may reasonably be expected for an increase from 250 to 1,000 lb. per sq. in. absolute becomes about 14.6 per cent. for a vacuum of 28 in., and 12.6 per cent. for one of 29.1 in.

In addition to the improvement which is obtained at the higher pressures, particularly when working with feed-heating and reheating, it would appear from test figures available that the efficiency curve is considerably flatter with the higher pressures, *i.e.*, the heat consumption of the station when running at the lower loads is relatively better than with the more normal pressures and temperatures.

High-pressure Boilers.

In a number of stations extra-high-pressure boilers do not differ at all in principle from the ordinary water-tube design for lower pressures. The difference is merely in the strength of the parts, notably the drums, in some instances obtained by employing thicker steel plates (1¼ in. thick) but the method of construction is that standardised for lower pressures. In

many other cases, however, the use of high pressures has led to the introduction of forged-steel drums, 34 ft. 4 in. long, 4 ft. outside diameter, with walls 4 in. thick; such construction is rather expensive.

An interesting variation in design for pressures of the order of 1,600 lb. per sq. in. is a boiler constructed by Messrs. Sulzer Brothers at their Winterthur works; it may be briefly summarised as a low-pressure boiler acting as a feed-water heater ancillary to a high-pressure boiler wherein all the high-temperature heat-transfer takes place.

Prof. A. G. Löffler, of Vienna, has developed a method by which it is claimed that steel cylinders which in the ordinary way would be suitable for pressures of about 450 lb. per sq. in. can be used to generate steam at 1,500 to 1,800 lb. per sq. in. No heat transfer occurs across the metal of the drum, but all to high-pressure saturated steam through superheater tubes. The high-temperature steam so produced is partly used for outside consumption, but the major part is passed into the drum, where it evaporates feed water as saturated steam, which is, in its turn, superheated and the cycle repeated. A 1,000 kW plant on this principle is being erected by the Vienna Locomotive Manufacturing Co.; steam is generated at 1,470 to 1,760 lb. per sq. in. and 750 deg. to 930 deg. F., and is used in a vertical steam engine. Further, an 18,000-kW plant with three large boilers of this type giving 130,000 lb. of steam per hour at 1,700 lb. per sq. in. and 900 deg. F. is being installed for the Witkowitz Coal Mining Co. in Czecho-Slovakia.

The Atmos boiler has for its main objective the elimination of costly drums by employing a number of large-bore tubes each arranged to revolve about its axis at some 330 r.p.m. The water enters the tubes at 1,500 lb. per sq. in., after being heated in a two-stage economiser to 600 deg F. The rotation of the tubes causes the water also to rotate and cling to the inner surface of the tubes, so that steam is produced steadily and passes away down the centre of the tubes; each tube, of which there may be from two to eight in a boiler, is rated at about 2,100 lb. per hour. Two boilers built on this principle have been installed at the Carnegie sugar refinery, Gothenburg, and more recently several others working in conjunction with De Laval steam turbines in Sweden and Germany.

In the Benson generator also the drums are eliminated, but quite a different method is employed to overcome troubles due to irregular ebullition in comparatively small-bore tubes under high pressure; in fact, no boiling, in the usual sense, occurs at all. The steam is all generated at the critical point, whereat water changes into steam without change of volume or addition of latent heat. This critical point for steam is at 3,200 lb. per sq. in. absolute and 706 deg. F. total temperature. Water is pumped at 3,200 lb. per sq. in. along a small-bore tube and gradually heated to 706 deg. F.; saturated steam leaves the tube at the other end and can then be superheated and throttled down to any desired pressure for use in a prime mover. The first boiler of this type was installed at Rugby in 1924 and 1925; coils of steel tubing, ¾ in. bore and ¼ in. thick, are wound round a vertical cylinder of refractory material about 8 ft. high and 7 ft. in diameter; the whole is surrounded by another wall, and the space between the two, containing the tubes, is also the combustion chamber. Distilled water is pumped continuously into the bottom of the coils by a motor-driven force pump.

Another boiler based on the same principle has been undergoing trials at the works of Messrs. Siemens-Schuckert at Siemensstadt, near Berlin. Instead of coiled tubes they are in the form of short horizontal lengths connected at the ends by bends. A second boiler of greater capacity is also now in course of construction at the same works; this will burn pulverised coal and deliver 50,000 lb. of steam per hour.

In spite of these new designs and principles, the tendency at present seems to be still in favour of the ordinary water-tube types with such modifications as the higher pressures may entail.

Turbines for High Pressures.

Much work has been done with steam pressures of the order of 1,200 lb. per sq. in., as used in several American plants, and up to 3,250 lb. per sq. in., as employed in the Benson boiler experiments. There are also a number of instances with more moderate pressures of 500-600 lb. per sq. in. both in America and on the Continent, so that at present there are about 30 power stations and industrial plants working satisfactorily with much higher pressures and temperatures than are normally employed. (Particulars of the tubine plant in these stations are given in the original paper.) It would appear that the general tendency is to use, particularly at the high-pressure end, many stages of small diameter; with a large number of stages where reheating is adopted, the multi-cylinder design will often give a simpler and more reliable construction.

High-pressure turbines may be divided into (A) turbines designed to expand the steam completely to vacuum (i) single cylinder with or without provision for interheating, (ii) multi-cylinder (extra-high-pressure cylinder coupled to normal-pressure cylinder); (B) turbines designed to exhaust against back pressure (i) direct drive, (ii) geared drive.

Many large generating stations at present working with low pressures and temperatures are faced with a serious problem when extension comes to be considered, and in such cases the adoption of the superposed high-pressure system offers great attractions; it becomes necessary to replace only part of the low-pressure boilers and to use a special high-pressure turbine exhausting into the existing main steam range, and thence, if necessary after re-superheating, into the existing turbo-generator sets.

Group A (i) is represented by a number of machines built by the General Electric Co. of America.

Group A (ii) contains quite a number of examples, but one only of the machines in this large section uses a pressure greater than 600 lb. per sq. in. When the aim is to increase the efficiency of an existing station, the pressures chosen are rather of the order of 1,000 lb. per sq. in., but in the case of a new station, or section of a station, the tendency seems to be to a limit of about 600 lb. per sq. in.

Quite a number of the turbines of this group are intended to operate with interheating between cylinders, in most cases accomplished by special "reheat boilers," but in two instances (the 208,000-kW machine to be installed in the State Line station and the G.E.C. No. 5 set at Crawford Avenue) live boiler steam is to be the medium, which means a rather lower reheating temperature, but it is claimed that this disadvantage is offset by the saving in cost of the plant.

Machines in this group are of Metropolitan-Vickers, Parsons, G.E.C. (America), A.E.G., Westinghouse, Allis-Chalmers, Erste-Brünner, Stork Bros., and Lange (Escher-Wyss licence) manufacture.

Ultimately a 104,000-kW Westinghouse set will be installed in Crawford Avenue station, U.S.A., which will be characterised by an interesting means of increasing the available exhaust area. There will be three cylinders, and both the intermediate and low-pressure cylinders will be of the double-flow type. After leaving the high-pressure unit and having passed through a reheater, one-third of the steam will be completely expanded in the intermediate-pressure cylinder, the other two-thirds partially expanded and then carried over to the double-flow low-pressure cylinder where expansion will be completed; the effect is thus a triple-exhaust served by six condensers.

The modern tendency is to employ impulse blading for the high-pressure portion and reaction blading for the low-pressure portion of the turbine, and a noticeable feature is the small diameter, particularly at the high-pressure end.

(To be concluded.)

Marking Imported Electrical Porcelain.

Merchandise Marks Act Inquiry.

THE inquiry, by the Board of Trade Standing Committee into the application by the National Council of the Pottery Industry for an Order in Council requiring that imported pottery—including electrical porcelain—should bear an indication of origin, was concluded on November 7th. The earlier proceedings were reported in our last issue (p. 795).

Mr. N. L. MACASKIE (counsel for the Electrical Importers' and Traders' Association) urged that the applicants had failed to make out a case. The electrical accessories manufacturers were not represented. The porcelain was only a part of an electrical accessory; the Committee, in its report on the recent application of the brassfounders for the marking of lampholders and other electrical fittings, had stated that the proper persons to apply were the representatives of the makers and users of electrical accessories. Therefore, the Committee had not recommended an Order, and the present case was similar. The amount of porcelain imported for electrical fittings was only 6 per cent. of the home production, and a considerable proportion of the imports consisted of steatite, which was not made in this country. An Order was necessary only where confusion existed in distinguishing between British and foreign products. There was no deception or confusion with regard to British and foreign electrical porcelain on the part of those who bought it. Therefore the application went by the board. Counsel urged that to stamp one component part of an electrical accessory would have the effect of branding the whole article as foreign. That would introduce difficulties and complications with the Customs authorities abroad, particularly in the Dominions. There were thousands of electrical fittings which it would be very difficult to mark, and in many cases marking would increase the cost. Electrical ware was imported because English prices were fixed, and were usually higher than the prices of the foreign goods. Finally, a marking Order would increase the difficulties of our own Customs authorities.

Mr. E. H. C. WETHERED (counsel for the applicants) said that they would not press for an Order providing that the mark of origin should be under the glaze in imported china and earthenware. In electrical ware there was often an unglazed surface, and they would be content if the mark was applied to that surface. He suggested that the Order should provide for "an indelible mark stamped, printed, impressed

or embossed on each article." They asked that the goods should bear the mark at the time of importation, and also at the time of sale. The latter provision would prevent unmarked goods leaking through the Customs and being sold retail without marks. They thought that the Order should not apply to articles where the available space was less than half-an inch square. Also, they would be content if refractory ware in electrical goods was excluded. Counsel would not agree that porcelain and steatite or British and foreign porcelain were sufficiently dissimilar to prevent confusion. Again, it was not proved that steatite was imported into this country to the extent stated. The actual amount was considerable, and a *prima facie* case had been established for an Order in the case of electrical ware. He claimed that the brass fittings inquiry had nothing in common with the present case, because the present applicants were the makers of the porcelain parts, and the application related not to complete units, but to parts. With regard to the suggestion that if the porcelain only were marked, buyers would imagine that the whole article was foreign, the remedy was to indicate in suitable words that parts other than the porcelain were British. Finally, counsel suggested that if an Order were granted its operation could be postponed for three months, to give time for the delivery of goods already ordered, and a postponement for six months would be sufficient to enable stocks in this country to be cleared.

This concluded the inquiry, and the Committee will report in due course.

National Electric Week.

Some Details of the Arrangements.

As everybody in the industry should know by now, the period from December 3rd to 10th has been reserved for a National Electric Week, under the auspices of the Electrical Development Association, as part of the Circle Campaign. Already between four and five hundred supply authorities and contractors in all parts of the country have notified their intention of participating in the arrangements, and no doubt every member of the industry will do his or her part to make the week a success.

The scheme is to combine the electricity-in-the-home campaign with Christmas-gift suggestions, and public attention

Window Display for the National Electric Week.

will be focused on the smaller domestic appliances which form useful and inexpensive presents.

The arrangements for the week are outlined in Working Programme No. 4 issued in connection with the Campaign. In this it is pointed out that the "National Electric Week" will be the culmination of the first part of the Campaign, and a successful issue will stimulate greatly increased enterprise in the second part. The publicity arrangements fall into two divisions—advertising and shop window displays. The Association is inserting two special advertisements in newspapers with a national circulation, and all electrical advertisers are asked to adopt this advertisement or some modification of it in their displays during the week. Electrical manufacturers and wholesalers are particularly requested to adapt their advertising to add weight to the movement. The general Press will be informed of the project well in advance, and it is hoped and anticipated that this will lead to the publication of special supplements.

With regard to the second part of the scheme, a special window "fit-up" has been designed. This consists of a representation of a massive switch with flexes dropping down to miniature cut-out figures engaged in the use of a number of domestic electrical appliances, supplemented by a large central figure. The whole of this is to be mounted two feet or more above the base of the window and to be surrounded by actual appliances. The fit-up is designed to enable modern colour-lighting effects to be demonstrated. The width of the design is 72 inches, and it is 48 in. high and 42 in. deep. The principal figure is 29 in. in height, and the display is printed in nine colours. A black-and-white reproduction of the display appears herewith.

A preliminary bombardment in the shape of a quarter of a million leaflets circulated free of charge is being put up by the Association to prepare the ground for the National Electric Week.

It is very interesting to learn from the E.D.A. that the following supply authorities have agreed to provide free electricity for window displays to those electrical contractors in their respective areas who are using the E.D.A. window display set during National Electric Week:—Bolton Corporation, Brierfield U.D.C., Cardiff Corporation, East Ham Corporation, Hamilton Corporation, Hendon Electricity Supply Co., Ltd., Inverness Corporation, Kensington and Knightsbridge E.L. Co., Ltd., Leek U.D.C., Metropolitan E.S. Co., Ltd., Minehead E.S. Co., Ltd., Paisley Corporation, Pooley Hall Colliery Co., Ltd., St. James' and Pall Mall E.L. Co., Ltd., Scarborough Corporation, South Wales Electric Power Distribution Co., Stafford Corporation and Merthyr Electric Traction and Lighting Co., Ltd. It is anticipated that many other undertakings will provide similar facilities.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Overhead Line Costs.

I am obliged to Mr. Theodore Rich for the figures given in his letter in your issue of November 4th.

Some of them I cannot understand, but in any case, they cannot be used as a straight comparison with English conditions, and there is no parity between the French and English requirements for such a line as is mentioned. In the first place the maximum sag with this small conductor (equal to about No. 8 s.w.g.), with 98-yard spans, is given as 5 ft. 1 in., whereas the present English Regulations would require a maximum sag of 16 ft. This means that the posts would be 11 ft. higher, the windage stress would be 11 ft. higher (it would also be much greater under English Regulations), and consequently a much stronger pole would be wanted.

The light wires with this big dip would require larger spacing between them to prevent them from being blown together in high winds.

It will be noted that the French concrete posts delivered cost about £2 4s. each, but a ferroconcrete post to meet the English Regulations for this particular line would cost over three times as much in this country. The cost of erection of the French posts is given as about £1 4s. each, an altogether impossible figure under English conditions. The cost of the erection of the line wire, which presumably includes binding in, is given as 300 francs for a kilometre run, which is equal to about 1s. 6d. per 100 yards of single wire. Such a cost appears utterly impossible unless they are paying the labour about 1¼d. per hour.

It is possible that the figures for erection are the net cost of the rough labour, without any supervision charges or overhead charges. The figures given include nothing for earth wire or earth plates.

It must be remembered that there is also a considerable difference between erecting a line of this description alongside a serviceable road, as is done in France, and across country as in England. I should say that under the conditions existing in this country the cheapest type of light line that can be put up is one on single creosoted wood poles.

J. A. Morton.

Huyton, *November 7th*, 1927.

Overhead Line Regulations.

I recently saw the e.h.p. overhead transmission line from Preston to Blackpool, and where it crosses the main road there is not any guarding or double wiring, which is usually erected under the main transmission wires.

I recently did a job myself in a small country village where the transmission voltage was only 500 volts, and I was forced to fix a proper guarding underneath the wiring in positions even where they crossed a small private road. I was informed that the e.h.p. line between Preston and Blackpool was in commission, and I was wondering if there had been any new regulations passed recently by the Electricity Commissioners.

which allow transmission wires of this voltage to cross a main road without guarding or any appliance to protect the public from falling wires. This is my only object in asking this question, as I was rather surprised at the information I was given. I shall be pleased if any of your readers can give me any information regarding this matter.

"Bilaw."

October 29th, 1927.

Trailing Cables for Mines.

As an engineer greatly interested in and responsible for the installation and maintenance of a large number of trailing cables for portable electrical apparatus for use in coal mines, I take the opportunity of thanking the author for the contribution on the above subject, published in your valuable journal of November 4th.

The author has expressed clearly faults which may be attributed in connection with the use of such cables. With regard to his statement on p. 767, which reads: "If inflammable gas or fine coal dust, which exists in *considerable quantities* in the vicinity of the coal-winning operations, is present an explosion may take place"—it occurs to me that no colliery owner or mine manager would take the responsibility of using any such cables under such conditions as are referred to, and I presume that the author has in mind the protection of human life from shocks as well as from fire or explosion

I agree with the author that the simplest form of trailing cable which complies with the regulations, as illustrated in fig. 1, does not provide for the necessary protection, as a metallic body can pierce the insulation and make contact with a live core without operating any protective devices. I have experienced instances where strands from broken haulage ropes have penetrated sheathing and have come into contact with live cores.

I have for several years entirely agreed with the views of Mr. Horsley—Chief Electrical Inspector of Mines—that the best type of cable is one in which the live conductors are surrounded with an earthed metallic sheath. Upon the introduction of the Ferflex cable, as shown in fig. 4, I installed several cables of this type, but these proved a complete failure, inasmuch as the continuity of the Ferflex braid was not reliable in view of so many broken strands, and it proved to be more of a *danger* than a protection. I am now installing cables of the type shown in fig. 8, and I consider this to be another excellent form of protection, provided that practical results prove it to be reliable. The efficient making of gate-end and machine-end plugs is of vital importance to the success of such cable; with the ordinary type of plugs supplied with gate ends and coal cutters, it is a most difficult matter to ensure the making of efficient ends, and the writer would appreciate particulars of cable plugs designed for use in connection with such types of cable. With regard to fig. 7, I consider this type of cable excellent for some classes of work in connection with coal face conveyors.

C. Jones.

Chasetown, *November 7th*, 1927.

The A.S.E.E. Presidential Address.

If your correspondent "Only a Wireman" cares to get into touch with me, I shall be pleased to send him a copy of Mr. Sillar's presidential address to this Association, in order that he may have the opportunity of reading and digesting its contents. "Only a Wireman" may then like to give the matter further consideration.

To write about an address which one admits one has not read is not only unfair to the address, but also to your correspondent.

It is not my intention to discuss the presidential address, but to refer to what appears to be the main fear of your correspondent, namely, that the chances of the proper remuneration and opportunities for advancement are not such as to encourage men to make themselves efficient, and that the efficient use of tools, by virtue of the conditions of employment, is a further detriment.

May I point out, in the first place, that 99 per cent. of the members of this Association are men who started at the bottom and have secured their present positions as the result of their practical knowledge of the tools combined with their theoretical training at the usual evening technical classes. This Association states quite clearly in its publications that "it is composed of practical technical men," and the members are rightly proud of their craftsmanship.

Your correspondent will find that skill in the use of tools is no hindrance to his advancement, but skilled use of the tools only will not achieve his advancement. The trouble with the majority of the "skilled men" is that they have neglected to acquire the necessary education to enable them to hold administrative posts. If "Only a Wireman" saw some of the reports sent in to firms by men who are "very skilled in the use of tools," he would appreciate more readily the reason why some men never advance further than a good-class wireman or charge hand.

Admitted that the operatives' organisation has not given the attention it might to the educational side of the movement, the operatives themselves are to blame for not availing themselves of other opportunities which exist. It may be that in this direction lies the reason why the applications for vacancies sent in by your correspondent have not secured him an interview. When a vacancy is advertised a large number of replies are received, and the employer only deals with a restricted number, and those with pages of redundant writing are not among the ones selected.

This Association has recognised the necessity for a higher standard of commercial education among skilled and practical men, and through its educational competitions, debating society, lectures, &c., has already achieved much success.

The trouble, in at least the contracting side of the electrical industry, is that a Union card is viewed by many as being more important than an efficiency card, with the result that the skilled man is not able or allowed to progress as he might otherwise do.

Owing to the many requests this Association received for wiremen (for which it does not cater as members) we opened an Employment Bureau for this class of employé some two years ago. The main stipulation for registration is efficiency, and, except during short periods of depression, the demand for men has always exceeded the supply. Although over 350 men have been found jobs through the Bureau, complaints have been very few. The Association has done this without any charge whatever to the men, and simply to keep the skilled man employed. Many cases could be cited where men placed through the Bureau have secured better positions.

I am afraid "Only a Wireman" has viewed Mr. Sillar's address from the wrong standpoint and has allowed his personal disappointments to dominate his thoughts.

A. Brammer,
General Secretary, A.S.E.E.

London, *November 5th*, 1927.

Verbal Signals in Automatic Telephony.

In your issue of November 4th your contributor, Mr. E. W. Durkin, calls attention to one of the serious defects in the present automatic telephone system of this country, *viz.*: the vague intricacy of the "tone" system of signalling from the subscriber's point of view. Assuring that the average new or embryo subscriber possesses normal intelligence (and disregarding, for the moment, the psychological fact that this intelligence often diminishes to about 50 per cent. of the original when he or she is about to endeavour to telephone), it must be realised that the ability to recognise these tones is not by any means always easy to acquire at an early stage, and it is this early stage which is so important in gaining or losing new subscribers.

The reading of the official instructions in the use of these tones leaves an impression in the mind of the average individual that the automatic system has been designed by engineers for the sole use of engineers.

It is remarkable that your contributor's suggestion has not been tried out already in this country, or at any rate some system of providing verbal signals other than by the use of selenium cells. The recent improvements in the wearing qualities of gramophone records, together with the development of "pick-up" devices of both electromagnetic and electrostatic types, should provide a very practical means of feeding verbal signals to the required selector contacts.

I understand that this method of providing automatic verbal signals has been in use for some time in several Continental manual exchanges, with very satisfactory results.

The large percentage of cases where subscribers on existing manual exchanges fail to recognise even the present "busy" tone and wait for the operator's verbal "number engaged," suggests that, if this system were adopted, a valuable saving could be effected in switching equipment, due to more prompt release.

Guy E. O. Taylor.

Weymouth, *November 4th*, 1927.

The Domestic Storage of Energy.

It is becoming more and more widely recognised that if we are to take full advantage of the great future possibilities of domestic electrification we must encourage the widest possible use of means whereby energy can be stored during off-peak hours. The thermal-storage system of water heating, described in Mr. Sims's recent articles in your paper, presents the possibility of an energy accumulator in every electric home, and the time is most opportune for concentrating our attention upon the many good features of this system, because water heating, as a load capable of big development, is at present receiving earnest consideration.

For the electric heating of water there are many other systems, some of them quite efficient and reasonably satisfactory from the consumer's point of view, and so readily saleable on account of relatively low first cost as to constitute a real danger that sales efforts unless controlled by a policy strictly based upon consideration of the loading requirements of the station, may result in a surrender of the opportunity to make any extensive use of the thermal-storage system with its many obvious advantages.

Thermal storage water heaters, restricted to off-peak hours by means of time switches or other suitable control, represent new load in a form so desirable that the supply authorities can afford to offer very material inducement to their con-

sumers to take it. Many undertakings are offering most attractively low tariffs—in some cases, perhaps, lower than is strictly necessary—but this does not entirely meet the case. A tank of size sufficient to store the whole day's requirements of hot water for the household is large, and its cost is more than the average consumer will be willing to entertain. This point constitutes the one big difficulty, and it would seem desirable, therefore, that supply authorities generally should consider the possibility of offering the inducement—or some part of it—in the form of assistance in the capital cost of installation. This might be done either as a direct contribution towards the cost or by offering the installation to the consumer on attractive terms of hire or hire-purchase.

R. J. Hebberd.

Hollinwood, *October 5th*, 1927.

With reference to Mr. Sims's article on the "Domestic Storage of Energy" in the current issue of your paper, we thought you might be interested to know that we can supply 50-ampere, 6 600-volt time switches of the self-contained type, and it is therefore not necessary to go to the extra expense of the remote-control type for this capacity.

We are also prepared to consider making even bigger capacity time switches of the self-contained type.

Venner Time Switches, Ltd.,
(E. E. SHARP, *Director.*)

November 5th, 1927.

With reference to my recent article, "Domestic Storage of Energy," I beg to point out that a slip has crept into the third instalment of this article. In the paragraph relating to time switches the statement that these astronomical clocks are readily made for use in any latitude is not correct. I intended to convey that clocks with astronomical dials are made suitable for use in any *longitude*, that is, the shape of the curves connecting switching-on time and switching-off time with time of year can be readily adjusted.

L. G. A. Sims.

Birmingham, *November 4th*, 1927.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1926.

2,410. "Regulators for electric circuits." J. G. Jackson. April 9th, 1926. (278,446.)

9,487. "Electric circuit breakers." W. B. Whitney, E. B. Wedmore, and British Electrical and Allied Industries Research Association. April 10th, 1926. (Cognate application, 23,937/26.) (278,764.)

12,210. "Installation of electrical accessories such as switches, couplings, and the like." J. A. Crabtree. May 12th, 1926. (278,770.)

14,586. "Alternating-current rectifying devices." S. Ruben. June 9th, 1926. (Addition to 272,068.) (278,776.)

14,660. "Electric heating devices." British Thomson-Houston Co., Ltd., and F. W. Leevers. June 10th, 1926. (278,778.)

16,790. "Loud speakers." B. Jirotka. July 5th, 1926. (278,780.)

17,046. "Thermionic cathodes." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. July 7th, 1926. (278,787.)

17,147. "Illuminated letters, or display signs for advertisement, and the like purposes." W. H. Broughton. July 8th, 1926. (278,792.)

17,171. "Variable electric condensers." A. Hall and Ferranti, Ltd. July 8th, 1926. (278,793.)

17,337. "Mercury and other vapour lamps." D. M. Lumsden. July 10th, 1926. (278,795.)

17,435. "Automatic telephone sub-station instrument circuits." S. G. S Dicker. October 23rd, 1925. (260,214.)

17,510. "Thermionic valves for use in wireless telegraphy or telephony." A. J. Stevens & Co. (1914), Ltd., and H. Taylor. July 13th, 1926. (Cognate application, 23,748/26.) (278,800.)

17,540. "Sparking plug." W. G. Clayton. July 13th, 1926. (278,802.)

17,678. "Adjusting mechanism for tuning and like devices for wireless apparatus." R. H. Berry and A. Ricordini. July 14th, 1926. (278,807.)

17,757. "Bow collectors for overhead wire systems of electric traction." Brecknell, Munro & Rogers, Ltd., and A. M. Willis. July 15th, 1926. (278,809.)

17,955. "High-frequency electrical apparatus." N. P. Hinton, H. G. Bell, and Metropolitan-Vickers Electrical Co., Ltd. July 17th, 1926. (278,812.)

18,244. "Thermionic amplifiers." Soc. Française Radio Electrique. July 22nd, 1925. (255,875.)

18,334. "Formers for supporting electric coils." Igranic Electric Co., Ltd., and W. M. Holbeach. July 22nd, 1926. (278,820.)

18,848. "Petrol-electric power transmission systems." L. V. Chenoweth and H. K. Whitehorn. July 28th, 1926. (278,826.)

18,939. "Personal headlamps." V. W. Holmes. July 29th, 1926. (278,827.)

18,965. "Selectors for telephone installations." Siemens & Halske Akt.-Ges. August 21st, 1925. (257,245.)

19,125. "Electric transformers." H. Tinsley and D. C. Gall. July 31st, 1926. (278,831.)

19,306. "Telephone transmitters." W. J. Rickets and E. E. Smith. August 4th, 1926. (278,833.)

19,416. "Electrical controlling means." H. L. Kirke. August 5th, 1926. (278,835.)

19,535. "Devices for producing acoustic oscillations." W. Brandegger. August 27th, 1925. (257,586.)

19,995. "Automatic telephone systems." Siemens Bros. & Co., Ltd. D. P. Long, and A. L. Wilkins. August 13th, 1926. (278,839.)

19,996. "Automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and D. P. Long. August 13th, 1926. (278,840.)

20,075. "Radio or high-frequency choke coils for wireless telephony." C. Oliver and Oliver Pell Control, Ltd. August 14th, 1926. (278,842.)

20,214. "Commutating rectifying apparatus for alternating currents of electricity." A. Barnett. August 16th, 1926. (278,853.)

20,545. "Suspension of street-lighting and similar lamps and lanterns." Simplex Conduits, Ltd., H. F. McLoughlin, and J. A. Phelps. August 20th, 1926. (278,865.)

20,580. "Voltage regulators for electric generators." A. K. T. Smith and B. Sykes. August 20th, 1926. (278,866.)

20,843. "Supporting of overhead conductors." Siemens Bros. & Co., Ltd., and W. E. Poole. August 24th, 1926. (278,847.)

21,049. "Automatic and semi-automatic telephone exchange systems." Siemens Bros. & Co., Ltd. August 31st, 1926. (257,616.)

21,268. "Means for protecting light current plant against the influence of heavy-current wires." Siemens-Schuckertwerke Ges. August 29th, 1925. (257,624.)

21,561. "Purification of zinc solutions preparatory to recovery of zinc by electrolysis." Rhodesia Broken Hill Development Co., Ltd. (R. H. Stevens, G. C. Norris, and W. N. Watson). September 1st, 1926. (278,851.)

21,944. "Electric remote-control systems." British Thomson-Houston Co., Ltd. September 14th, 1925. (258,296.)

22,885. "Means for mounting the magnet systems for wireless-telephony instruments." P. W. Baker, C. H. Stave, R. M. Ellis, and Climax Radio Electric, Ltd. September 16th, 1926. (278,864.)

23,795. "Electromagnetic speed indicator and distance counter." G. Mombur. September 26th, 1925. (258,900.)

24,000. "System for protecting weak-current conductors from being influenced by heavy-current conductors." Siemens Schuckertwerke Ges. February 27th, 1926. (Addition to 257,624.) (266,606.)

24,129. "Galvanic cell having an electrode consisting of manganese dioxide and acetylene soot." P. Burger. September 30th, 1925. (259,220.)

24,387. "Means for mounting electrical fuses and the like." J. H. Tucker & Co., Ltd., and J. E. Gaffney. October 2nd, 1926. (278,876.)

25,525. "Electric urns and like liquid heaters or boilers." T. H. McQuinn and H. M. Sargood. October 13th, 1926. (278,883.)

25,814. "Reels for electric cables, wire, and the like." F. W. Chambers. October 16th, 1926. (278,888.)

26,012. "Manufacture of cables." R. T. Vanderbilt Co., Inc. March 22nd, 1926. (267,880.)

27,806. "Registering and/or recording devices for electromotors." J. Fiddes. November 5th, 1926. (Cognate application, 14,403/27.) (278,898.)

28,008. "Batteries, accumulators, and the like." T. A. Hodgkiss and W. E. Smith. November 13th, 1926. (278,903.)

31,292. "Arrangement for interconnecting the element of storage batteries." S. Dall'Anese. December 12th, 1925. (262,804.)

31,821. "Electron-emission devices." N. E. Paine. December 15th, 1926. (278,919.)

32,245. "Electrical signalling and/or controlling systems." Metropolitan-Vickers Electrical Co., Ltd. January 16th, 1926. (264,472.)

1927.

1,631. "Electrical resistance devices." Igranic Electric Co., Ltd. (Pacent Electric Co., Inc.). January 14th, 1927. (278,930.)

2,700. "Electric lampholders." H. L. Smith and E. W. Fletcher. January 31st, 1927. (278,936.)

3,343. "Electric regulating systems." British Thomson-Houston Co., Ltd. February 4th, 1926. (265,617.)

3,415. "Electric regulating systems." British Thomson-Houston Co., Ltd. February 5th, 1926. (265,622.)

4,214. "Electric switches." R. W. L. A. Ham. February 15th, 1927. (278,941.)

4,413. "Cathodes for electric discharge tubes." F. Meyer and H. J. Spanner. July 10th, 1926. (274,027.)

6,665. "Apparatus for the projection of light." L. J. Steele and H. Martin. June 10th, 1926. (Divided application on 267,171.) (278,949.)

8,182. "High-frequency circuits and indicating arrangements therefor." Telefunken Ges. für Drahtlose Telegraphie. March 25th, 1926. (268,367.)

8,461. "Electrical phonograph apparatus." Brandes Laboratories, Inc. January 29th, 1927. (278,967.)

9,635. "Piezo-electric devices." Telefunken Ges. für Drahtlose Telegraphie. April 8th, 1926. (269,192.)

9,816. "Dynamo-electric machines." Metropolitan Vickers Electrical Co., Ltd. April 12th, 1926. (269,206.)

10,940. "Thermostatic switches." Metropolitan-Vickers Electrical Co., Ltd. April 23rd, 1926. (269,932.)

11,575. "Method and means for filing tubular electrodes of electric accumulators." A. Fraass. May 27th, 1926. (271,845.)

12,107. "Voltage-regulating devices." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 20th, 1926. (271,445.)

12,536. "Cooling dynamo-electric machines." British Thomson-Houston Co., Ltd. May 11th, 1926. (271,078.)

12,697. "Railway signalling systems." Automatic Telephone Manufacturing Co., Ltd., and R. W. Tarrant. May 11th, 1927. (278,980.)

13,367. "Electrical motors." Chicago Pneumatic Tool Co. May 29th, 1926. (271,864.)

14,169. "Electric safety lamps for miners." J. G. Dalcz. May 20th, 1926. (271,890.)

14,161. "Electric safety lamps for miners." J. G. Dalcz. May 26th, 1926. (271,891.)

15,497. "Mast for carrying electric aerial lines." G. Kjaer. June 9th, 1927. (278,991.)

16,979. "Electric conductors." F. Melwald. December 14th, 1926. (278,973.)

19,272. "Self-starting asynchronous motors." International General Electric Co., Ltd. July 23rd, 1926. (Addition to 237,911.) (274,878.)

20,697. "Casing for an electromechanical lamp." C. Bernasconi and R. M. Berthier. August 10th, 1926. (275,975.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 2nd:—

Loewe-Radio (lettering and design). No. 479,624. Class 8. Radio-telephonic apparatus and parts thereof.—Loewe-Radio Gesellschaft, Berlin. (British representatives: Edward Evans & Co., 27, Chancery Lane, W.C.2.)

Varlex. No. 481,194. Class 8. Electric coil winding.—Oliver Pell Control Co., Burrage Road, Woolwich, S.E.18.

Phillipon (lettering and design). No. 483,105. Class 8. Radio-telephonic valves.—H. Zealander, trading as H. D. Zéalander & Co., St. John's House, 124-127, Minories, E.1.

Halcyon portable wireless receivers (lettering and design). No. 483,927. Class 8. Radio-telephonic receiving sets.—Halcyon Wireless Co., Ltd., 110, Knightsbridge, S.W.1.

Thermattaix. No. 483,881. Class 8. Thermo-electric generators for use in radio-telegraphy and telephony.—Attaix, Ltd., 106 & 106a, High Street, Southampton.

Varistor. No. 484,090. Class 8. Instruments and apparatus for use in radio-telephony.—Thorp Roderick, Ltd., 12, Balsaee Street, Bedford.

Mopic. No. 483,840. Class 13. Electrical appliances, &c.—Midland Electric Power Installation Co., 1, Old Mill Street, Wolverhampton.

Omega. No. 484,274. Class 13. Incandescent electric lamps (ordinary).—Omega Lamp Works, Ltd., 83, Merton Road, Wimbledon, S.W.19.

Navalion. No. 483,670. Class 21. Submarine telephones.—Alfred Graham and Co., Ltd., 37, Walbrook, E.C.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALCOMBE.—Business stores, for the Minehead Co-operative Society; W. J. Tamlyn, architect, Minehead.

ALVASTON.—Greyhound racing track, with electrical work (£25,000), for Derbyshire Greyhounds, Ltd.; John Gambles, Nottingham, chairman.

AMERSHAM.—School, Terriers; Director of Education, Bucks. Education Committee, County Hall, Aylesbury.

BRENTWOOD.—Headquarters for Essex Territorial Army Association; Lieut.-Col. E. U. Bradbridge, secretary; Chelmsford.

BRIGHTON.—Furniture factory, St. George's Road, for E. Tully (several thousand pounds).

CHATHAM.—Two schools, for the borough E.C.; borough surveyor.

CHELMSFORD.—Premises, electrically equipped, for Hedley Fitch, sports outfitter, 36, High Street. County offices (£91,569), for Essex C.C.; J. Stuart, county architect, Springfield Old Court.

CHELTENHAM.—Cinema, assembly rooms, café, &c., on Imperial site; E. Garfield, Hampton Road, Birmingham. Greyhound racing track; Young & Gilling.

CHESTER.—Housing scheme (152), Eaton Road; C. Greenwood, city engineer, Town Hall.

CHESTERFIELD.—Roman Catholic church; Wilcockson and Cutts, architects. Housing scheme (20), for the T.C.; Jackson & Fryer, architects, Stephenson Place. Court house and police cells (£3,299), for the T.C.; A. Heath, builder. Alterations, municipal buildings; A. Heath.

CHICHESTER.—Beet-sugar factory; Anglo-Dutch group of beet-sugar companies.

CLEETHORPES.—Health clinic (£3,846), for the U.D.C.; Scorer & Gamble, architects, Bank Street, Lincoln.

DEWSBURY.—Housing scheme (150), for the T.C.; borough surveyor.

EASTBOURNE.—Offices and stores, Waterworks Road; G. Bainbridge & Sons.

EASTLEIGH.—131 houses, for the U.D.C.; J. Lawrence, clerk, Council Offices.

EDINBURGH.—Child welfare clinic (ultra-violet ray treatment), for Corporation, to cost £1,700; city architect.

EGHAM (Surrey).—Housing scheme (50), for the U.D.C.; H. Hartwell, surveyor.

ERITH.—School, for the E.C.; Director of Education. Houses (126), for the U.D.C.; builders: Walter Jones & Sons, Westminster (50) and Blackwell and Meyer, Erith (76).

FALKIRK.—Shops, bakehouse and house, for A. D. P. McGregor, Robert's Wynd (£3,000).

FARNHAM.—Secondary school, for the governors of the Girls' Grammar School; clerk.

GLASGOW.—Conversion of Lennox Castle into home, for Parish Council (£6,000); the clerk.

GRANTHAM.—Married quarters at Spittlegate Aerodrome; Brown & Co., builders.

GREENOCK.—High school; master of works, Renfrewshire Education Authority, Paisley.

GUILDFORD.—Restaurant, 35-37, North Street; W. Triggs Turner.

HANLEY.—Cinema, Piccadilly, for the Provincial Cinematograph Theatres, Ltd.

HASTINGS.—Alterations, Robertson Street, for Plumer, Roddis, Ltd., drapers.

HULL.—Extensions, east district destructor works; city engineer. Erection of University College (£122,500); Education Committee.

IRISH FREE STATE (Co Wexford).—Sanatorium, for the County Board of Health; G. Flood, engineer to the Board.

KEIGHLEY.—Sewage works (£80,000); borough engineer.

LANCASTER.—Joint isolation hospital; Lancaster and Morecambe Corporations.

LEEDS.—Schools; Dr. Graham, Director of Education, Education Offices, Culverley Street.

LETCHWORTH.—Secondary school, in the centre of town; Director of Education, Hertfordshire Education Committee.

LINCOLN.—Illumination of new showrooms, for the Lincolnshire Motor Co., Ltd.; E. W. Horton, builder, 6, Shakespeare Street. Illumination of new shops in High Street; C. L. Lucas, builder, 2, Sibthorp Street. Floodlighting of new garage, Wragley Road, for Parker Taylor Co., Ltd.

LONDON (E.C.).—Shops and flats, New Street; L. & W. Whitehead, Ltd.

(Barking, E.).—80 houses, Cecil Gardens estate; C. Gray. Shop, East Street; F. W. Woolworth & Co., Ltd. 73 houses, Lyndhurst Gardens; J. R. Leftley.

(Hackney, E.).—Factory, Morning Lane; A. Roberts and Co., Ltd.

(Ilford, E.).—Battery shop, Grove Road; Fuller's Accumulator Co., Ltd. Alterations, skating rink, High Road; A. W. Corby. Elementary school, Redbridge; Education Committee.

(Leyton, E.).—High school, for Essex E.C.; J. Stuart, architect, Springfield Old Court, Chelmsford.

(Poplar, E.).—Additions, Union Oil and Cake Mills, Orchard Place; E. L. Mason.

(Finchley, N.).—54 houses; U.D.C. surveyor.

(St. John's Wood, N.W.).—Block of flats, Park Road; H. Murray, 11, Suffolk Street, Pall Mall.

(St. Marylebone, N.W.).—Salvage plant; Mr. Brunt, consulting engineer.

(Bayswater, S.W.).—Reconstruction, Whiteley's premises, Queen's Road; Selfridge & Co., Ltd.

(Streatham, S.W.).—Elementary school, The Vale; L.C.C. Education Committee.

(Wimbledon, S.W.).—Concert Hall, rear King's Head Hotel, Merton High Street; G. P. Deverall Saul. Additions, factory, Riverside Road; Jas. Burges & Sons.

(W.).—Restaurant club, ball room, garage, &c., New Piccadilly Theatre; A. Stone, architect, Hay Hill, Berkeley Street, W.

LUTON (Beds.).—St. Andrew's Church (£16,000); Sir G. G. Scott, architect.

MANCHESTER.—Extension of Hyde Road, car depôt; city architect, Town Hall.

MITCHAM.—Girls' secondary school (£33,094), for Surrey E.C.; Patman & Fotheringham, builders, Islington. Two schools, for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

MORECAMBE.—Premises, corner Regent Road and Clarendon Road; Lancaster and District Co operative Society, Ltd. Fire station and 'bus depôt, Calton site; borough engineer.

NEWCASTLE-ON-TYNE.—Reconstruction of the Playhouse, Benton Bank; Marshall & Tweedy, 54, Grey Street, architects.

NEWMARKET.—Extensions to fever hospital (£6,348), for the U.D.C.; Ambrose & Son, builders, Ely.

NORTHFLEET.—Central school; Kent Education Committee.

ORSETT (Essex).—Housing scheme (78), for the R.D.C.; surveyor, Palmer's Avenue, Grays.

PAISLEY.—Shops and houses, for Galbraith's Stores, Ltd., 53, Back Sneddon Street; the manager.

PORT GLASGOW.—Central area improvement scheme (£15,468), for Corporation; burgh surveyor.

PRESTWICH.—Refuse plant; Petrie & McNaught, Ltd., Rochdale. 70 houses, Langley estate; M. J. Gleeson, Ltd., Sheffield.

ROCHESTER.—Additions, including pathological laboratory, St. Bartholomew's Hospital; Read & McDonald, architects, 16, Cork Street, London.

RYE (Sussex).—Re-erection of the Rother Ironworks, South Undercliffe; proprietors.

SMETHWICK.—Housing scheme (106), Warley, for the T.C.; Roland Fletcher, borough engineer.

STOKE-ON-TRENT.—Conversion of premises into mental defective institution, for the T.C.; town clerk.

THRYBERGH (Rotherham).—Roman Catholic schools (£7,000), for managers of St. Gerard's Church; priest-in-charge.

TWICKENHAM.—68 flats, for the B.C.; F. W. Pearce, borough engineer.

ULVERSTON.—Clinic and welfare centre, The Rookery; Lancashire Education Committee.

WINCHESTER.—School (£15,249), for the city E.C.; H. J. Goodall & Son, builders, Basingstoke.

WOLVERHAMPTON.—School, Low Hill estate (£17,150), for the T.C.; Corporation Education Committee.

YORK.—Children's block and extensions to Fairfield Sanatorium, for the T.C.; F. W. Spurr, city engineer.

WHITEHAVEN.—54 houses, Kells estate; borough engineer.

WORKINGTON.—Re-erection of the Queen's Opera House (£18,000), for Messrs. Graves, Maryport.